FLIGHT
and
AIRCRAFT ENGINEER

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The Outlook

Air Racing Again

FROM every point of view one must applaud the decision (reported in *Flight* last week) of the Royal Aero Club to revive air racing this year. It cannot have been an easy one to reach, bearing in mind the many restrictions and limitations with which present-day life is surrounded, but there is no doubt that the public will welcome an opportunity for such a break in the austere monotony to which the nation is condemned.

Particularly gratifying is the revival of the King's Cup Race, and the choice of Birmingham Airport was a logical one in view of the fact that it was there the 1939 race was to have been held. The date was to have been September 2nd, but by that time the country had something more serious to think about and was starting on an air race of a very different sort.

The last King's Cup Race was flown in 1938 over a triangular course, with the de Havilland airfield at Hatfield as starting and finishing point. It was won by Alex Henshaw on a Percival Mew Gull at 236.25 m.p.h. For the 1939 race a short course had again been chosen, but an innovation was introduced by proposing to re-handicap the machines after each of the eliminating heats, thus ensuring a very close finish in the final. The Royal Aero Club has not yet announced the regulations which will govern this year's King's Cup Race except to state that the course will be a short, closed-circuit one.

Apparently the same course will be used in the National Air Races, which are also to be held during the August Bank Holiday week-end. In spite of the official title of these races, six of the events will be open to international competition. It may, perhaps, be doubted that the prize money (a minimum of £1,500 has been guaranteed) is sufficient to attract many entrants from overseas. Our American friends in particular will be apt to regard this as "chicken feed," in view of the very large sums that are to be won at their National Air Races. But they will realize that in its present poverty-stricken state England cannot be expected to do things on quite such a grand scale.

Aeronautical Indigestion?

THERE never was a time when the interchange of technical information between the Western nations was of greater importance. Aeronautical development is entering upon a new era, the advent of turbojet and turboprop power plants having introduced a host of new problems in design, manufacture and operation.

While doubtless there is a good deal of passing of research knowledge and data at Government levels, it is upon the designers and technicians, as well as upon the men and women in the factories, that the translation of the laboratory results into practical flying machines will ultimately depend. The holding of conferences is, therefore, to be welcomed most warmly.

Two such conferences are scheduled for the near future: the First International Congress of the Aeronautical Industries, to be held in Paris from May 9th to May 18th; and the Second Anglo-American Conference, which is being held in New York from May 23rd to May 26th.

A list of the papers to be presented in New York was published in *Flight* of April 7th. This week, on p. 447, we give a brief outline of the subjects to be discussed in Paris. The papers to be read are too numerous to list, but the speakers are drawn from several countries, including America, Belgium, Great Britain, France and Sweden.

It is accepted that all this information will prove very valuable, but one may doubt the practicability of trying to cram so much into so short a time.

Another "First"

WITH the first flight of the Armstrong Whitworth Apollo, referred to on the opposite page and illustrated by first photographs, Great Britain has added yet another rung to the ladder of progress. There have been several first flights by new military prototypes, to some of which reference is made in this issue.

In the meantime it is very satisfactory to be able to record that the Coventry product, first referred to in any detail in *Flight* of August 21st, 1947, has been sufficiently completed to be ready to fly.

Taking into consideration the many difficulties with which the aircraft constructor is faced when producing a prototype, it is commendable that Armstrong Whitworths have been able to get this first example of an axial-flow turboprop airliner into the air in so short a time.

America Wins

LACK of uniformity in the types of navigational aid on which the control of air traffic should be based has been a great worry to operators and governments alike. The British Ministry of Civil Aviation has fought hard for the adoption of "Gee," but was faced by strong opposition from the advocates of radio range and air lanes. The Gee-response from other European countries was so poor that only five to ten per cent of civil aircraft were carrying the equipment.

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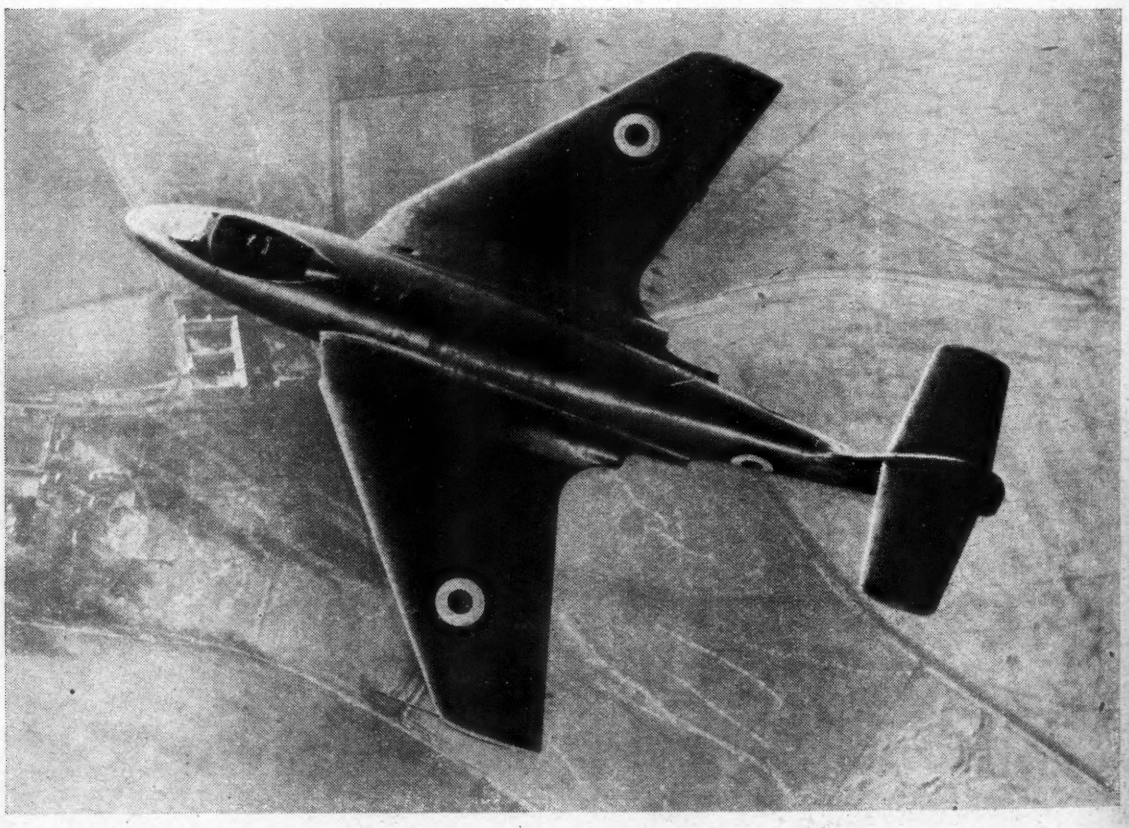
Another drawback was that it was found that the establishment of area controls throughout the United Kingdom, as originally planned, was too costly, although in theory the Gee system is still regarded as the correct one in present circumstances.

However, the opposition proved too strong, and it has now been decided to adopt the radio-range system, in spite of the fact that it is somewhat out of date and has certain disadvantages. The air lanes system will be similar to that which has been employed in America for many years, where it has proved its practical value, but the Ministry of Civil Aviation does not regard it as the final answer to the air traffic problem.



THE STAMP OF SPEED: Remarkable in performance as are the straight-winged P.1040 and its Naval counterpart, the N.7/46, Hawker Aircraft are aiming at much higher Mach numbers with the experimental P.1052, seen above to have swept-back wings and to retain the characteristic split jet pipe for the Rolls-Royce Nene.

The first photograph to be taken of the A.W. Apollo in the air. Powered with four Mamba turboprops, it is designed to cruise at 305 m.p.h. at 20,000ft.

Apollo Airborne

Armstrong Whitworth's Mamba-powered Airliner Makes a Successful Initial Flight

SLOWLY (as it may seem to those of us who are anxious to fly British on all occasions), but nevertheless surely, the plans of the Brabazon Committee are reaching fruition. On Sunday, April 10th, the first Apollo —built under Ministry of Supply contract by Sir W. G. Armstrong Whitworth Aircraft, Ltd., to the Brabazon 11B specification—made a completely satisfactory initial flight.

Mr. E. G. Franklin (centre), the test pilot on the maiden flight, gives his first impressions to Armstrong Whitworth engineers after landing. Mr. W. H. Else is seen directly behind him.

B 7

At the controls were A.W.A. test pilots E. G. Franklin and W. H. Else. They took the prototype Apollo (which has Armstrong Siddeley Mamba 2 turboprops) into the air for approximately 30 minutes, during which time they climbed to 6,000 ft and obtained sufficient impressions of general handling qualities to give a satisfactory report. The weight on take-off was 29,000 lb (normal all-up weight is 37,000 lb and maximum weight 39,500 lb), and the two pilots were the only occupants.

Two Apollo prototypes are ordered, the second of which is to be fully furnished and equipped. Apart from being turbine-powered (Britain now has two makes of turboprop civil transports flying), this medium-range aircraft is pressurized up to a differential of 5½ lb/sq in, and has other modern features, including reversible-pitch three-bladed de Havilland airscrews 10 ft in diameter.

A projected variant of the Apollo with longer fuselage and an estimated payload of 10,000 lb (2,500 lb increase) has been studied. It would have accommodation for a maximum of 45 passengers in place of the present layouts for 24 or 31. Civil or military freighter, ambulance and personal versions of the Apollo have also been planned.

The second Apollo is now out of its jigs and at the final assembly stage, while the first prototype is at present undergoing intensive inspection and is not expected to fly again until this work has been completed.

The particular version of the Mamba 2, four of which are installed in the first Apollo, develops a maximum of 1,010 s.h.p. plus 307 lb static thrust. The Apollo power unit complete was illustrated in the April 7th issue of *Flight*, and the turboprop itself was described in the issue of March 18th last year. So far as the Apollo aircraft is concerned, a cut-away drawing and full constructional details appeared in *Flight* of August 26th last year.

It is, perhaps, noteworthy that this important first flight was made from an airfield—Baginton, Coventry—which is grass-covered and has no runways.

Graduation Day

Duke of Gloucester at Cranwell for First Post-war Passing-out Parade

A GLANCE round the orderly precincts of the Royal Air Force College, Cranwell, on the morning of Friday, April 8th, gave the visitor ample evidence that the occasion was an important one. For the first time since the beginning of the war, fully-trained officer cadets were making a final ceremonial appearance on the parade ground before receiving their permanent commissions. Air Chief Marshal His Royal Highness the Duke of Gloucester had consented to review the graduation parade, and present prizes to outstanding members, of No. 46 Entry.

The presence of many eminent officers of air rank among the spectators reflected official interest and satisfaction in this renewal of the flow so vital to the regular Air Force. They included Air Chief Marshal Sir John Slessor (Commandant of the Imperial Defence College), Air Marshals Sir Leslie Hollinghurst (Inspector-General of the R.A.F.), Sir Hugh Walmsley (Deputy Chief of Air Staff), Sir John Baker (A.O.C. Coastal Command), Sir Aubrey Ellwood (A.O.C. Bomber Command), and Air Vice-Marshals Sir Charles Longcroft (first Commandant of the College) and Sir Basil Embry (soon to become A.O.C. Fighter Command).

After the four squadrons of the cadet wing had marched on under their own commanders, accompanied by the College Band, the King's Colour, presented by His Majesty last summer, was escorted into position; the parade then stood ready, under the command of G/C. Oliver, Assistant Commandant, for the arrival of the Duke of Gloucester.

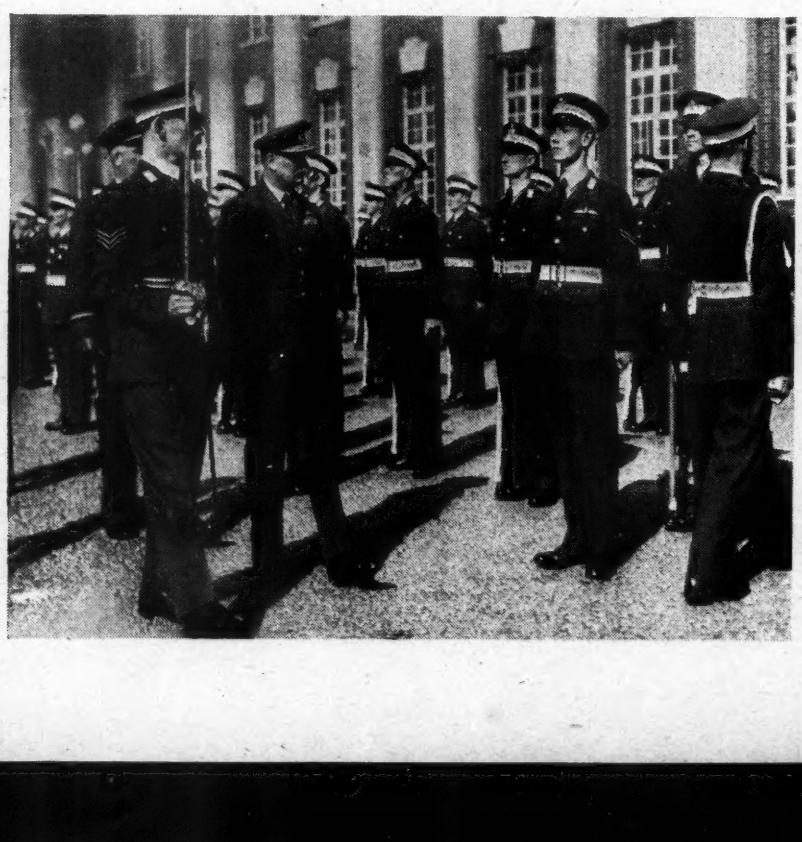
Air Chief Marshal H.R.H. the Duke of Gloucester presents the Sword of Honour to F/Cdt. U/Off. Pledger. Standing behind the Duke is A. Cdre. Beamish, the Commandant.

The Duke stepped on to the parade ground with A. Cdre. Beamish, the Commandant; Lord Tedder, the Chief of the Air Staff; Air Marshal Sir Hugh Saunders, Air Member for Personnel; and Air Marshal Sir Ralph Cochrane, A.O.C. Flying Training Command.

His Royal Highness inspected the cadet wing and returned its salute as it marched past in quick and slow time and advanced in review order. In both appearance and bearing the cadets were extremely smart, although one or two drill movements prevented truthful application of the term "faultless" to the entire parade. In fairness, however, it must be recorded that weather conditions were not ideal, for, despite bright sunshine, an exceedingly cold and blustery wind interfered with precise movement.

As the 30 graduating cadets left the parade ground, the remainder of the wing presented arms in salute, members of the succeeding senior entry took command, and the parade was dispersed.

Two portraits, of the King and Queen, by Edward Seago, R.B.A., have been entrusted to the College by the Air Council. The paintings, which are hung in the central block, were unveiled by the Duke after the parade and before his inspection of the instructors and aircraft of the flying wing. The spick-and-span



Paraded in front of the main College block, the Cadet Wing is inspected by the Duke.

array of Harvards, Ansons and Prentices matched the standard set by the cadets.

In the College gymnasium, where the prize-giving ceremony was held, A. Cdre. Beamish expressed thanks to His Royal Highness for the honour of his presence, a further gracious act following on the King's visit to Cranwell in July last year. Of the entry passing out, the Commandant spoke warmly: the many activities which had grown up during the past two years had centred on the 46th Entry, particularly the 15 cadets who had arrived in October, 1946, when conditions at the College were in an uncomfortable state of transition. Outlining progress in studies, the first branch of the Cranwell syllabus, A. Cdre. Beamish remarked that the entry had shown how, contrary to accepted principles, it was possible to acquire a good insight into technical problems by being told how an experiment would be conducted were the apparatus available.

He was confident that no invidious comparisons need be feared with contemporary pilots trained in other establishments—by current service standards six members of the entry were rated as above average, 22 as average, and only two as below average. Each cadet had flown an average of 210 hr. 15 min. in Tiger Moths and Harvards, with 14 hr. 15 min. of night flying. Despite lack of instrument flying in the basic stage, the entry had obtained 15 white-card ratings. He mentioned the advantage enjoyed by the present entries, who, now that the Prentice was available, would fly at night early in their training.

Development in College sport—a very necessary adjunct to normal training—was very closely associated with the entry. At first, they had endured crushing defeats from reputable sides, in particular from their arch-opponents, the Royal Military Academy. Last year, however, they had beaten Sandhurst at Rugby football on their own ground, and in their own professional sphere, rifle shooting. A. Cdre. Beamish emphasized the value of other activities of the College, including visits to the sister services, and to other countries. In conclusion, he paid a tribute to the staff of the College, to whose guidance the entry's achievements were an independent tribute.

Recalling the Service records of the 931 earlier cadets—who during the war won a Victoria Cross, three George Crosses, 82 D.S.O.s and 269 D.F.C.s—the Duke of Gloucester declared his pleasure at the revival of the College.

For the runners-up, there was encouragement in the Duke's remark that it was not what they did at Cranwell that counted, but what they gave to the Service. Before presenting the prizes, he wished all the cadets success in their future careers. A list of prizewinning cadets of the entry appears below.

Without exaggeration, the occasion may be set down as worthy of inclusion in any future history of the Royal Air Force. Impressive as the ceremony was in spectacle alone, it also represented the revival of a system upon which the spirit and efficiency of the Service will depend to an increasing extent. Cranwell has grown in tradition and reputation, and, reassuringly, it stands more firmly established than ever before.

PRIZEWINNERS

Sword of Honour; Groves Memorial Prize; Dickson Trophy	F/Cdt. U/Off. P. V. Pledger
King's Medal; Air Ministry Prize for Imperial and War Studies	F/Cdt. Cpl. A. B. Stinchcombe
Philip Sassoon Memorial Prize	F/Cdt. U/Off. T. L. Kennedy
Chance Memorial Prize	F/Cdt. U/Off. M. B. Le Poer Trench
Abdy Gerrard Fellowes Prize	F/Cdt. Cpl. K. E. Richardson
Royal United Service Institution Award	F/Cdt. W. D. R. Lamb

FULMER'S FIRST FRUITS

MUCH useful investigation, mainly in the metallurgical field, has already been carried out by the Fulmer Research Institute, which has recently issued its first annual report. The period covered dates from the opening of the establishment in July, 1947, and the report shows that the number of staff has increased from 45 to 65.

With laboratories and offices in the house and grounds of a country estate near Slough, Bucks, the Institute is a private enterprise financed by Almin, Ltd.—the parent company of the well-known light-alloy group—and sponsored independently by some forty other firms, organizations (of which the Ministry of Supply is one) and individuals.

The chairman is Col. W. C. Devereux, C.B.E., F.R.Ae.S., and Mr. E. A. G. Liddiard, M.A., F.I.M., directs research.

AN INTERNATIONAL CONGRESS

DURING the last week of the Paris Aero Show an international congress is to be held at which papers will be read by representatives of many countries. The meeting is being organized by the *Union Syndicale des Industries Aeronautiques* (which corresponds in some measure to our S.B.A.C.), with several other bodies collaborating.

The congress will begin its meetings on May 9th, and conclude on May 18th. Owing to the very large number of papers to be presented, three or four will be read concurrently, and the subjects have been classified.

Class I deals with experimental aerodynamics, the determination of shapes, strength calculation of components, and performance calculations. M. Louis Breguet will preside. Class II, over which M. Portevin will preside, is devoted to the development of materials; and Class III, presided over by M. Saulnier, has for its subjects prototype construction, test methods and general tuning-up.

Class IV (president, M. Heriel) is of special interest to manufacturers, as it deals with series production of aircraft; Class V (M. Anxionnaz) is devoted to power plants; and Class VI (M. Morelle) to equipment and accessories.

Class VII has a wide subject in ground organization and equipment, and is presided over by Mr. Hederer; Class VIIb is devoted to light-aircraft problems; and Class VIII, over which M. Potez will preside, will attack the many human problems connected with the training and work of employees.

Full particulars of the papers to be read, and of where and when they are to be read, can be obtained from *Le Secrétariat Général du Premier Congrès International des Industries Aéronautiques*, 4, Rue Galilée, Paris.

NEW HELICOPTER RECORD?

THE Fairey Gyrodyne, the first full description of which appears in this issue, will probably have established a new world's record by the time these words appear in print. It was intended to set up a 100-km closed-circuit record last Tuesday. Only impossible weather conditions could prevent the attempt, and as no other helicopter has been put over the 100-km course for official record purposes, a record would be established. Next week we hope to describe the flight and publish the actual speed.

It will be recollected that last June the Gyrodyne set up a new world's speed record of 124.3 m.p.h. over a 3-km straight-line course at White Waltham, where the attempt on the 100-km record was also to be made. Start and finish were to be at White Waltham, with turning points at Newbury and Bagshot. It was expected to complete the course in less than half an hour, which would represent an average speed slightly better than the straight-line record.

With the exception of the Gyrodyne record and the "feminine" record held by Hanna Reitsch on the old Focke-Achgelis FW 61, all present world's records are held by the Sikorsky R-5A. The figures are: Duration, 9hr 57min; distance over a closed circuit, 1,000 km (612.4 miles); distance in a straight line, 1,132.34 km (703.6 miles); altitude, 5,842 m (19,167ft); speed over 1,000 km, 107.2 km/h (66.65 m.p.h.).

RADIO EQUIPMENT DEMONSTRATED

EXAMPLES of modern British ground and airborne radio equipment were shown recently to the I.C.A.O. delegates attending the African and Indian Ocean Region air-navigation meeting, to representatives of foreign Embassies, and to other interested officials. The show, held at Bovingdon, was sponsored by International Aeradio, Ltd., and leading firms co-operated by providing exhibits and a technical staff to answer the queries of the visitors.

Four demonstrations were staged, including a control-tower layout, a V.H.F. radio keying link, a teleprinter terminal and an emergency airport electrical plant designed to take up the load automatically should a failure occur in the supply from the mains.

Among the firms exhibiting were: British Telecommunications Research, Ltd.; Cossor Radar, Ltd.; Decca Navigator Co., Ltd.; E. K. Cole, Ltd.; General Electric Co., Ltd.; Marconi's Wireless Telegraph Co., Ltd.; Murphy Radio, Ltd.; Plessey Co., Ltd.; Pye Telecommunications, Ltd.; Rediffusion, Ltd.; Standard Telephones and Cables, Ltd.; and Stratton and Co.

HERE AND THERE

Educational

THE name Varsity T.1 has been selected for the new Vickers 648 advanced trainer, described in *Flight* of March 17th.

North American Defence

CANADAIR, Ltd., of Montreal, may build the 670 m.p.h. North American F-86 fighter. Mr. Howe, Canadian Minister of Trade and Commerce, announced on April 13th, that America had granted the Dominion a licence to manufacture the aircraft.

Airways Appointment

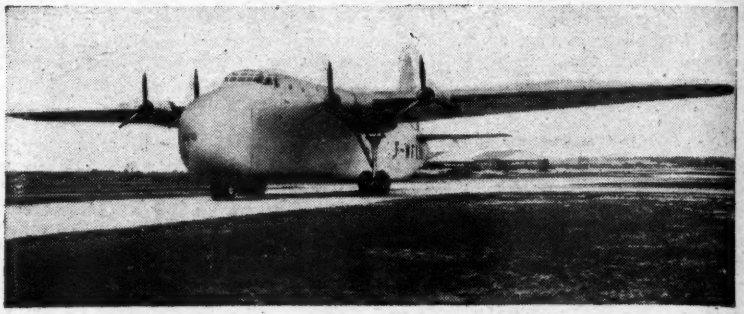
FOLLOWING the appointment of Mr. J. W. Booth, Chairman of B.S.A.A., to the board of B.O.A.C., the Ministry of Civil Aviation announces that the major corporation's chief executive, Mr. Whitney Straight, has joined the board of B.S.A.A. without further remuneration.

Bréguet's Newest

POWERED by four S.N.E.C.M.A.-Argus inverted vee-12 engines of 580 h.p., the Bréguet 892 Mercure is a medium transport laid out on Marathon lines, but of greater capacity. A twin-engined variant, styled 890-H is under development.

One-way Boomerang

OF flying-wing design, a guided missile developed by the Aeronautics Division of Australia's Commonwealth Scientific and Industrial Organization is reported to have jet units flanking its warhead. The power plant should be ready for testing late this year. Flight trials on the Woomera range will follow.



FRENCH FREIGHTER : Undeterred by the loss of the first prototype Cormoran (N.C. 211), the Aerocentre organization has completed and flown the second example, here shown. The pilot was M. Dellys. A Cormoran fuselage was a showpiece in the Paris Salon of 1947.

"Swept" Attacker Flying

AS most readers will have probably surmised, the Vickers-Supermarine 501, existence of which was lately revealed, is a development of the Attacker with swept-back wing and tail surfaces. Designed for investigation of problems associated with flight at and beyond the speed of sound, it has so far proved "very satisfactory" during flight trials.

AIRLINES and AIRPORTS

NEXT week's issue of Flight, dated April 28th, will be specially devoted to the latest developments in airport and airline operation. Articles by specialists, colour maps of Britain's home and overseas air routes, and reviews of equipment, will be included. A preview of British exhibits at the Paris Aero Show will also be given.

Car Ferry Re-opened

RUN successfully on a charter basis last summer, the Lympne to Le Touquet car ferry re-opened as a scheduled service on April 13th. Single fare for a car up to 14ft long with four passengers is £27; Silver City Airways' Bristol Freighters make the journey in 20 min.

Service Soccer

APRIL 13th proved an unlucky day for R.A.F. Station St. Athan, when its soccer team was beaten 2—1 at Uxbridge by the Halton eleven in the Service final. Howley and Forde scored for Halton, and the St. Athan goal was scored by Fox.

Officers' Welfare

THE Newton Driver Services Club, at Rustington, Sussex, which is to be opened by the Duke of Edinburgh on April 23rd, provides opportunities for rest and recuperation for officers, particularly those whose health suffered from wartime injury or captivity.

Non-profit-making, and with bedroom accommodation for 40, the Club has a miniature golf course, sports deck, library, gymnasium and boat-building shop. It has been founded by Mrs. Newton Driver, who, during the war, established and ran the English Speaking Officers' Club at her home in Park Lane.

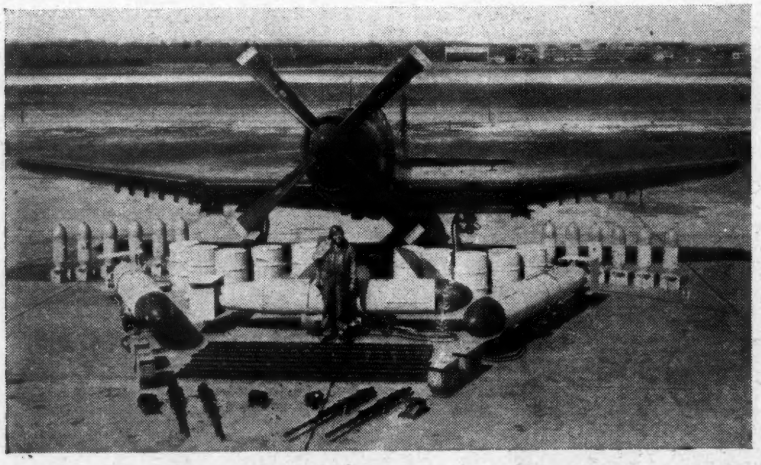
High-speed Research

CONDITIONS for achieving Mach numbers of up to 5 can be produced in the new supersonic wind-tunnel built by North American Aviation of Los Angeles, California, and described in the May issue of *Aircraft Production*, published next Monday. This issue also contains a further article on the manufacturing technique adopted for the Handley Page Hermes IV and Hastings aircraft, another on the air-cooled copper cylinder heads developed for Bristol sleeve-valve engines and a review of production equipment at the forthcoming British Industries Fair at Birmingham.

Naval Broadcaster Honoured

IN recognition of his services as a publicist for the Navy, and for Naval Aviation in particular, Capt. A. M. Kimmins, O.B.E., R.N. (ret.), has been appointed the first Honorary Commander of a Royal Naval Volunteer Reserve Air Squadron. His command is No. 1832 Squadron, equipped with Seafires, which operates from Culham.

Capt. Kimmins was one of the first naval pilots to fly solo and make deck landings. After breaking his back in a ski-ing accident in Switzerland he turned to a successful writing career. He rejoined the Navy during the Munich crisis; after a series of well-remembered broadcasts on wartime operations, he became Chief of Naval Information in the Pacific.



ALL FOR ONE : Bombs, torpedoes, guns, ammunition, fuel and pilot together make up a new record disposable load, totalling 14,179 lb, carried by a single-engined aircraft. The machine responsible is a Martin AM-1 Mauler (3,000 h.p. P. & W. Wasp Major), which recently flew at an all-up weight of 29,332 lb—a 3,812 lb increase on its best previous figure.

Happy Landings

DURING February, passenger- and troop-carrying aircraft of the R.A.F. flew 4,266,000 passenger-miles without accident.

Swedish Strength Increases

IF proposals to the Swedish Parliament are approved, as expected, Sweden may have the strongest air force in Continental Europe. The Defence Minister has asked for about £4 million to buy 90 new fighters, the sum to be spread over the budget years 1949-53.

Far-East Charter

A GROUP of Hong Kong business men have chartered a B.O.A.C. Solent flying boat to carry them to the British Industries Fair. The aircraft left Southampton on April 10th on its way to Hong Kong, flying via the Middle East, Pakistan, India, Rangoon and Singapore. This is the first time a B.O.A.C. Solent has flown to the Far East.

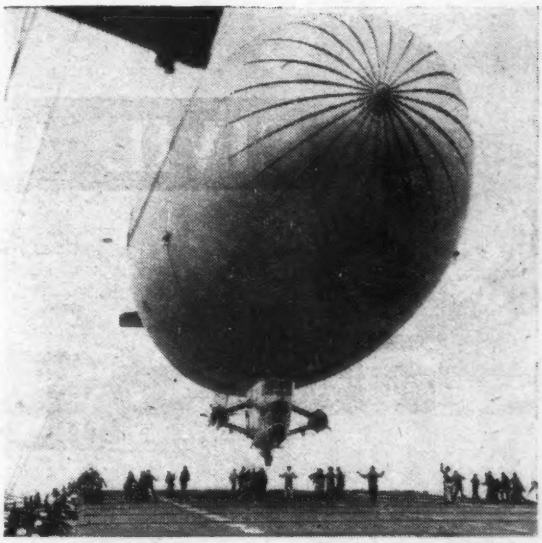
CANADIAN CALLERS: Recent visitors to Gloster Aircraft, Ltd., were Mr. D. H. Rogers (left), and Mr. D. D. Murphy, chief test pilots of, respectively, Avro Canada and the Civil Aviation Division of the Canadian Transport Department.

New H.Q. for Kingston Cadets

AT the opening ceremony of No. 328 A.T.C. Squadron's new headquarters in Kingston-on-Thames, G/C. G. B. Keilly, D.F.C., A.F.C., expressed the hope that the Squadron would become the biggest and best in the country. The Mayor of Kingston, Councillor Oldfield, said that the town was proud of the smartness and enthusiasm of its A.T.C. unit. No. 328 Squadron has its own wireless station, which operates under 65 Group W/T. Watch Control.

POW-WOW: Mr. Eric Williams (centre), author of "The Wooden Horse" with two of his companions in the escape from Stalag Luft II—Mr. Michael Codner (left) and Mr. Oliver Philpot. The occasion was a Foyle's luncheon in honour of Mr. Williams.

MANY HANDS: Deck crews bring a U.S. Navy blimp into position on the carrier Sicily as it returns from a patrol during manœuvres in the Caribbean.



Carrier Transfer

THE 36,800 ton carrier, H.M.S. *Eagle*, under completion at Belfast, has been taken to Gladstone Dock, Liverpool, for the fitting of propellers, as the Belfast dry docks were not large enough to admit her width. Returning to Belfast about the end of next month, the carrier will probably be commissioned early in 1950. H.M.S. *Eagle* was launched by Princess Elizabeth in 1946, but work on her was delayed to enable the latest technical developments to be incorporated.

Ministries' Dramatics

THE Adastral Players—amateur actors of the Air Ministry and Ministry of Civil Aviation—will present Sir Arthur Pinero's comedy "Trelawney of the Wells" at the Scala Theatre on May 24th and 25th. Musical settings will be provided by the Central Band of the R.A.F., conducted by S/L. A. E. Sims, M.B.E., who has composed special incidental music for the occasion. Tickets, at prices from 2s 6d to 10s 6d, are available from Mr. R. J. Riddles, Room 120, 19/29, Woburn Place, London, W.C.1.

A.T.C. Flying Scholarships

WITH Air Ministry approval, the Air League of the British Empire will this year introduce a scholarship scheme to provide flying training for selected A.T.C. cadets. Cadets chosen will be brought up to the new Private Pilot's Licence standard, and will have their certificates of service endorsed accordingly, for R.A.F. consideration when they enter the Service.

Cadets will be nominated by Squadron Commanders, with final recommendations going forward from group headquarters to Reserve Command. Their training, which will include 30 hours' flying, will begin at week-ends, and end with a two-week course at an approved flying school. The extent to which the scheme can operate depends on the funds available, and the Air League will gratefully receive any assistance towards the cost of the scholarships.

News in Brief

THE *Sperry Review* reports that the Ministry of Supply has ordered 70 Attacker Naval fighters from Vickers-Supermarine, Ltd.

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Thos. Cook and Son, the travel agents, have opened an office in Basra, with Mr. R. Woodward in charge. Main activity at present is expected to concern air movements to and from Basra.

* * *

The two wholly-owned De La Rue plastics subsidiaries of De La Rue Insulation, Ltd., and Hill, Norman and Beard Plastics, Ltd., will in future operate together as the Plastics Division of Thomas De La Rue and Company, Ltd.

* * *

The first flight of the prototype Convair B-36D, which has four J-35 turbojets in addition to its six Wasp Majors, lasted 3 hr 15 min. Take-off, at a gross weight of 280,000 lb, was shortened from 5,000ft to 3,500ft, and a height of 40,000ft was reached during the flight. An illustration of the B-36D appeared in *Flight* of April 7th.

* * *

Mr. C. I. Orr-Ewing, O.B.E., who recently resigned from the B.B.C. Television Service, has joined Cossor Radar, Ltd., as a director. He served on the radar staff of the Air Ministry from 1939 to 1941, and in 1943 became chief radar officer with the Mediterranean Allied Coastal Air Force, and later with the Air Staff of S.H.A.E.F.

* * *

Designed and manufactured by the Pye Telecommunications and supplied by Marconi, a complete A.B.A.S. installation for Pretoria Airport, South Africa, was recently shipped from this country—the first complete equipment of this nature, claim the makers, to be exported from Britain. The equipment weighed 10½ tons and the whole order was completed in five weeks.

IN AFRICA'S HEART: Watched by the always-interested local populace, one of the de Havilland Dove fleet of West African Airways Corporation makes a refuelling stop at Gusau, Northern Nigeria.

B.E.A.'s Ambassadors : I.C.A.O. and Africa : Radio Ranges for Britain

AMBASSADOR FLEET AT LONDON AIRPORT

AGREEMENT has been reached between the Ministry of Civil Aviation and British European Airways Corporation that B.E.A.'s new fleet of Airspeed Ambassadors will be based at and operated from London Airport. Delivery of the first aircraft is expected next year and the fleet will be put into operation during 1951. Eventually all civil air services at present using Northolt will be transferred to London Airport and the intention is that the move will be completed by the end of 1954, involving an extensive building programme at London Airport.

B.O.A.C. BUYS SWEDISH STRATOCRUISERS

FOLLOWING the return of Sir Harold Hartley and Sir Miles Thomas from Sweden, British Overseas Airways Corporation has announced that, with the approval of the Government, four Boeing Stratocruisers have been purchased from Scandinavian Airlines System. The purchase price, including spares, is stated to be £3,000,000, of which only a very small portion, for replaceable parts, is being paid in dollars.

The Corporation has purchased these aircraft, which will increase the future Stratocruiser fleet to ten, to offset in particular the loss of capacity caused by the grounding of the B.S.A.A. Tudors. The possibility of purchasing further aircraft is being closely considered.

BIRMINGHAM'S AIR SERVICES

A RECENT ceremony at Elmdon Airport, Birmingham, attended by Lord Pakenham and Lord Douglas, marked the opening of Birmingham's first air service since the war and its first direct link with the Continent since the airport was opened in 1939. A B.E.A. Dove inaugurated a service which is run jointly by B.E.A. and Air France between Manchester, Birmingham and Paris. The full service started on Monday, April 11th, with a return flight each day.

I.C.A.O. AFRICAN PROPOSALS

A WORLD-WIDE survey by I.C.A.O. of the facilities and services required for safe and economical international air transport was completed in London on April 12th, when the last of the series of ten Regional Air Navigation Meetings concluded. During this final meeting air services in the African/Indian Ocean Region were reviewed in detail, and plans—stated to be "realistic and economical"—were drawn up for submission to I.C.A.O. member-states. The measures were aimed to improve such facilities as airports, air traffic control, telecommunications, meteorology, search and rescue.

Instrument landing systems, it was agreed, should be installed on five or six airports in Africa, and meteorological facilities—which will become increasingly important with the use of jet aircraft—must be considerably extended. Search and rescue plans along the sea routes and over the vast desert areas like the Sahara were also agreed upon, and it was considered that with the adoption of the plans drawn up at this meeting air operations throughout the Region should become both simpler and safer.

K.L.M. EXECUTIVE'S DEATH

IT is with regret that *Flight* learns of the death, after an operation, of Mr. Henri Fuchs, assistant vice-president of K.L.M. and chief of the airline's general operations group. Mr. Fuchs joined K.L.M. as a pilot in 1933, gained extensive experience on its routes and, eventually, in 1938, was flying as a captain on the 9,000-mile Amsterdam-Batavia service. He was 41 years of age.

RADIO RANGES FOR BRITAIN

THE announcement of the decision to instal the radio-range system of navigational aid in the United Kingdom means that the Ministry of Civil Aviation has at last given up its fight for "Gee." Since most aircraft carry M.F. receivers, they can operate on the M.F. radio range. The problem has been to decide the most beneficial pattern of corridors, ten miles wide, which could be planned with the minimum number of radio ranges. Based on five installations of the Adcock type at Prestwick, Liverpool, Filton, Dunsfold, Gravesend, and possibly one on the Isle of Man, the proposed scheme covers the majority of the more heavily laden routes in the country.

The routes to be covered by the air lanes will be: London, Birmingham, Liverpool, Prestwick; Prestwick, Belfast; Belfast, Liverpool; Dublin, Liverpool; Liverpool towards Scandinavia; two lanes to France (one way only in and out); one lane to Holland and Belgium; London, Bristol and towards Shannon—which is in reality a lane to the west for transatlantic traffic. There will also be a route to the Channel Isles which will not be covered by radio ranges.

The air lanes or corridors will extend vertically from 5,000ft to 11,000ft, and within them all civil aircraft will be strictly controlled and will be called upon to comply with rules which are being drawn up, but control will apply in all weather conditions.

Military aircraft will also comply, though provisions could not be made for jet fighters and other types on operational exercises. If the Services find themselves compelled to route fighters through the air lanes the aircraft will, where possible, be kept under radar control, and information will be passed to Uxbridge, who will so far as possible co-ordinate the informa-

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tion with other aircraft movements. The onus of passing such information will be on the Services.

Immediately beneath the air corridors—that is, from 5,000ft down to 2,500ft, there will still be control of civil aircraft, but those which climb slowly after take-off may be compelled to run the gauntlet of that air space for some distance. However, alterations are being made to the Metropolitan Control Zone which should help the situation to some extent. In the corridors, as everywhere else, vertical separation between aircraft will be 1,000ft, and no lateral separation rules will be formulated. There will, however, be observance of the I.C.A.O. ruling which requires aircraft to be separated in time by ten minutes.

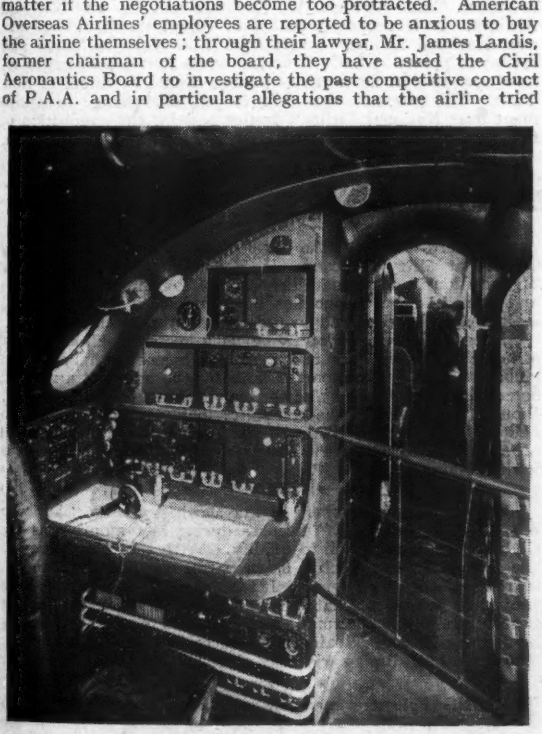
Aircraft will be required to keep to starboard of centre of the radio-range leg. A procedure has not yet been worked out to avoid collisions where corridors cross one another. Outside the air lanes the existing Flight Information Regions will continue as at present. There will also be fan marker beams along the corridors for checking position, and the experimental radar unit at London Airport will be available to observe the progress of aircraft along the corridors leading to the London area. Gee cover will continue over England indefinitely, but the future of Gee chains in other areas is not yet known.

The total scheme, including apparatus and its installation, will cost about £180,000 or more. British equipment will be used when possible, but unfortunately there is no British equivalent of this type of radio equipment available, and the Treasury have agreed for purchases to be made from America. It is hoped that the scheme will be working by the end of this year.

P.A.A.-A.O.A. DEAL UNCERTAIN

PAN AMERICAN AIRWAYS' proposed purchase of American Overseas Airlines may be abandoned if the deal cannot be completed by the middle of September. The proposal is at present being considered by the Civil Aeronautics Board and both lines have stated that they are prepared to drop the whole matter if the negotiations become too protracted. American Overseas Airlines' employees are reported to be anxious to buy the airline themselves; through their lawyer, Mr. James Landis, former chairman of the board, they have asked the Civil Aeronautics Board to investigate the past competitive conduct of P.A.A. and in particular allegations that the airline tried to prevent mail payments to other carriers competing with it on the Atlantic and South American routes.

If the proposed purchase is carried through, Trans-World Airline will be P.A.A.'s only American competitor on the Atlantic route and they (T.W.A.) are trying to persuade the Civil Aeronautics Board to make a review of the Atlantic area. An independent freight carrier, Seaboard and Western Airlines, is also intervening in the enquiry.



TIDY INSTALLATION: Marconi equipment in the Vickers Viscount. Items are, left to right (top row), A.D.F. bearing indicator and M.F. aerial loading unit; (middle row), H.F. aerial loading unit, M.F. drive unit, and M.F. amplifier unit; (bottom row), beam-approach receiver, A.D.108 receiver, A.D.7092 receiver, H.F. drive unit, and H.F. amplifier unit. Below the radio officer's table are power units and voltage regulators.

AVRO XIX ACCIDENT REPORT

THE accident to Avro XIX G-AGNI which came down in the sea off the Isle of Man on June 11th, 1948, is the subject of a report* by the Chief Inspector of Accidents. Owned by Universal Flying Services, Ltd., the aircraft was under charter to Lancashire Aircraft Corporation, Ltd., and operated by a crew supplied by North Sea Air Transport, Ltd.

The fuel tanks had been filled to a total of 100 gall against a total capacity of 140 gall so that the maximum number of passengers could be carried without exceeding the authorized maximum all-up weight. The aircraft had made two flights, from Squire's Gate to Ronaldsway and from Ronaldsway to Barrow, before it left Barrow at 0750 hr G.M.T. on a charter flight with seven passengers to Ronaldsway, Isle of Man. During the flight the pilot was given a fix which showed he was a little south of his intended track, and he altered course to an extent which he considered would bring him to Ronaldsway, but he later received QDMs from the airport which showed he had flown to the west of the island. He eventually sighted the island but, owing to shortage of fuel, was forced to ditch at 0905, in Port Erin Bay, about a mile from the shore. The occupants, all uninjured, were rescued by a rowing boat and a motor launch, and the aircraft sank after about an hour.

In the opinion of the Chief Inspector of Accidents the failure of the pilot to locate the island during the initial approach was due to faulty navigation, but the fact that one of the QDMs given by Ronaldsway was incorrect (though corrected a minute later) was probably a contributory cause of the accident.

As a result of this investigation a recommendation has been made that the Avro XIX cabin-roof emergency exits should be either modified or redesigned to ensure effective operation, as some of the passengers had tried to escape through these exits but had been unable to open them. Tests were carried out on similar aircraft and confirm the passengers' statements that the release mechanism was unsatisfactory.

**Ministry of Civil Aviation; Accidents Investigation Branch Report No. C.525. Price 1s. His Majesty's Stationery Office.*

BREVITIES

WITH the introduction of B.E.A. summer schedules on April 11th, stewards were withdrawn from most of the internal services and no refreshments are now served on the routes. The exceptions are the main trunk routes—London-Glasgow, London-Belfast, London-Edinburgh—and the new Birmingham-Paris service.

* * *

To-day, April 21st, following representations by the Trade Union side of the National Joint Council for Civil Air Transport, Sir Miles Thomas, chairman-designate of B.O.A.C., is to meet local joint panel committees from the B.O.A.C. establishments at Croydon, Hurn and Hythe. The Corporation's plans for the distribution of component repair work will be discussed.

* * *

Passengers on board the first aircraft on the B.E.A. Welsh service were greeted on their arrival at Cardiff on April 11th by Lord Douglas, the B.E.A. Chairman, and the Lord Mayor of Cardiff. Among the passengers were Lady Megan Lloyd George, the vice-chairman of the Anglesey County Council and the chairmen of Caernarvonshire, Flintshire, and Denbighshire County Councils and Mr. Gordon Erridge, B.E.A. Manager for North Wales.

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At present the Cobeta Manchester-Brussels service operates two return flights each week, DC-3 or Lockheed aircraft leaving Ringway Airport at 1300 hr on Tuesdays and Thursdays and arriving at Melsbroeck Airport at 1515 hr. Westbound flights, made on the same days, leave Melsbroeck Airport at 0830 and reach Ringway at 1145 hr. On Thursday, May 19th, one

IN "FLIGHT" NEXT WEEK:

SPECIAL FEATURES ON AIRPORT AND AIRLINE OPERATION

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extra return flight each week will be added, flying every Thursday at the same time. Fares are £11 1s single and £19 18s return. The Glasgow-Manchester-Brussels service has been suspended. Commencing June 14th and continuing until October 15th, Cobeta will operate a fast direct service between Manchester and Le Zoute for Belgian Coast holiday resorts. Three return flights a week will be made, on Tuesdays, Thursdays and Saturdays. Fares will be £9 13s single and £17 8s return.

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The sum of £105,000 has been voted by the Jersey State Session to continue the extensions to Jersey Airport started by the Germans during the occupation.

* * *

Olley Air Services, Ltd., have recently equipped their fleet of Dove aircraft with the latest Marconi radio-compass direction-finding apparatus and claims to be the first charter company to fit this specialized equipment.

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The third conference of the Joint U.S.-Canadian Air Facilitation Committee of I.A.T.A., at present being held in Bermuda, is discussing the simplification of customs and immigration procedures at airports along the mutual frontier.

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Four officials from Zurich are visiting American airports before commencing alteratons to Zurich Muncipal Airport. Their tour includes the inspection of blind-landing and traffic-control systems.

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Following the end of operations by Ambica Airlines, Air-India has been granted the route Bombay-Baroda-Ahmedabad, and a daily service in each direction started on March 28th with Douglas DC-3 aircraft. Mysore has been added as a permanent call on the South Indian route and the daily service now flies Madras-Bangalore-Mysore-Coimbatore-Cochin-Trivandrum.

* * *

Canadian Pacific Airlines, shortly to begin a service between the west coast of North America and the Far East and Australia, recently joined the International Air Transport Association, bringing the active membership total to 62; there are also eight associate members. Mr. Hans Dedekam, assistant secretary to the I.A.T.A. Traffic Committee at the head office in Montreal, has been appointed acting secretary of the I.A.T.A. branch office in Singapore.

The Air Registration Board has recently made a fourth issue of Sub-Section R.2 of *British Civil Radio Requirements*. The notice gives the requirements for the installation of radio apparatus in aircraft, including the grant and renewal of approval and the necessity for approval of modifications.

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In the House of Commons recently, Mr. G. S. Lindgren, Parliamentary Secretary to the Ministry of Civil Aviation, said that there were no airfields in North-east England under the control of the Ministry. Development of a new airfield at Boldon was still in the planning stage but beyond their present resources.

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Excursion rates, valid for 60 days, have been introduced by Pan American World Airways between Central American resorts and the islands in the Caribbean. These rates, with reductions of up to 30 per cent, will be effective from May 15th until September 30th. Excursion rates last year were valid for 21 days and proved very popular.

* * *

Capt. A. Instone, a pioneer of Instone Air Lines (which lost its identity upon the formation, in 1924, of Imperial Airways) has formed a company to develop air charter business with French firms. To be known as Instone Air Transport, Ltd., the new company will not act as aircraft operators but will be a link between the air charter department of Instone Lines and French companies. Capt. Instone is to be chairman.

* * *

Aer Lingus has appointed Mr. W. H. Whelen, previously District Manager at Shannon Airport, as District Manager for London, following the resignation of Mr. J. Ballantyne. Mr. Whelen joined the traffic department of Imperial Airways in 1931 and remained with them when they were incorporated. After service in R.A.F. Coastal Command he joined Aer Lingus.

* * *

A proposal to provide a through air passenger service between New York and Latin America has been submitted to the Civil Aeronautics Board and involves Pan American Airways, Pan American Grace Airways, W. R. Grace and Co. and National Airlines. It is proposed that Pan American should operate over National Airlines' routes from New York to Miami and thence to points in Latin America, while Pan American Grace, now operating as far north as Miami, should fly direct to New York. The proposal also calls for an interchange of equipment over National Airlines' routes and for the acquisition of stock, in National Airlines by Pan American and W. R. Grace.

FROM THE CLUBS

FOR some time past, members of the Paris staff of Air France have had their own private flying clubs, three in number and situated at Aulnay-sous-Bois, at Villejuif near Orly, and in Paris itself. On April 3rd M. Pinaud, the Minister of Transport, opened a fourth, the Air France Aero Club and Flying Centre, at Mitry-Compans. It is the intention of the new organization to co-ordinate the work of the three original clubs and thus to effect economies in technical, instructional and maintenance services and in the operation of aircraft.

Although the choice of flying as a recreational hobby for airline workers savours rather of the busman's holiday, the clubs are very well supported both by the administrative and commercial departments and the technical and operational staff. Pioneer employees of the company, incidentally, have a club called "Les Anciens d'Air France" and organize social and other events, to which the younger generation of employees is invited.

ANTIPODEAN OCCASION: At the Royal New Zealand Aero Club's pageant at Mangere, Auckland: Air Chief Marshal Sir Keith Park — now representing Hawker-Siddeley interests in Australia and New Zealand—with G/C. J. D. Nelson (left) and Mr. E. S. Caro, of Engineering Alliance, Ltd., who have imported two Chrislea Super Aces, one of which is seen in the photograph.

* * *

AMONG the six members of the Darlington Aero Club who obtained their "A" licences during last month was the Club's first woman pupil to qualify. With the co-operation of the Newcastle Aero Club a dawn patrol was held on Sunday, March 27th, in which 17 aircraft took part. These patrols have proved so successful that a series has been organized for the near future. The chairman, Mr. J. Neasham, is shortly going on a tour of France, Spain and Morocco in his Proctor aircraft. The annual air display will take place on Saturday, June 11th.

* * *

DURING February members of the Cambridge Aero Club logged a total of 65 hours, and in March 79 hours were recorded. Bad weather prevented the club's youngest member, Mr. Michael Marshall, from making his first solo flight on his 17th birthday, but the next day the weather improved sufficiently for him to make his solos and to complete the flying tests to obtain his "A" licence. Three other members of the club obtained their "A" licences and three made their first solos.

Fairey Gyrodyne

Design Survey of the World's Fastest Helicopter

WHEN one examines those delightful old prints which so enchantingly, and sometimes extravagantly, portray the earliest ideas of man-carrying flying machines, it is notable that, among the aerodynes, the division is about equal between fixed-wing and rotating-wing types.

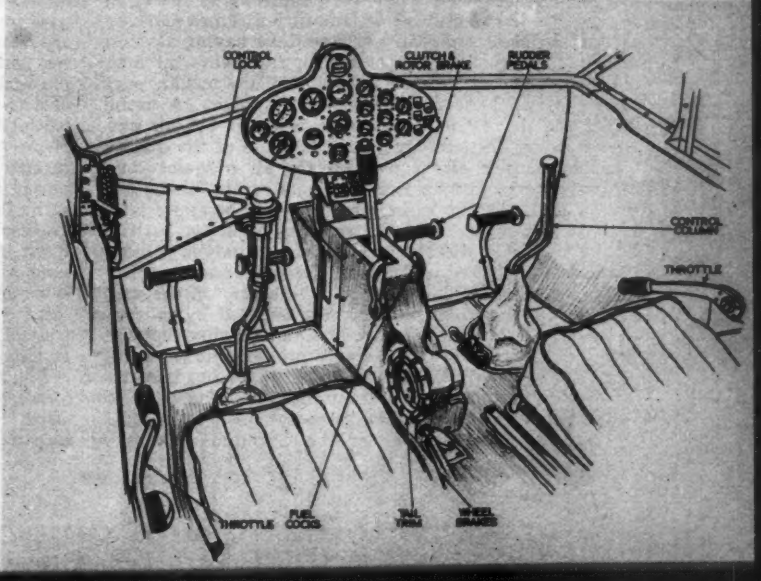
It was, perhaps, quite fortuitous that man's attempts to fly were first attended with success on a fixed-wing type. Very nearly 20 years elapsed, in fact, before the first successful flight occurred with a rotating-wing aircraft: this was made on January 9th, 1923, when Juan de la Cierva first flew the type of aircraft which later became familiar as the Autogiro.

The history of rotating-wing flight is a history of dogged struggle in the face of official lethargy and lack of financial support. Had one-thousandth of the money expended on the development of fixed-wing aircraft been made available for development of rotating-wing types, the progress made in the latter field would have been enormous. As it is, although the advance has certainly been considerable, it has been relatively slow. Nevertheless, a certain parity exists with fixed-wing conditions in that by far the greatest measure of development progress has been made within the last 15 years.

The uninitiated viewer of the rotating-wing field may well be forgiven the erroneous impression that the first and biggest and best helicopters were, and are, American. Whilst in no way wishing to denigrate the valuable rotating-wing work done in the United States, we think it only fair to point out that, whereas Igor Sikorsky, who can be regarded as the father of American helicopter development, did not make his first controllable free flight until May, 1940, a British helicopter—the Weir W. 5, designed by G. and J. Weir, Limited, and flown by Mr. R. A. Pullin—achieved free controllable flight on June 7th, 1938. As in other instances, the war held up helicopter progress in this country, but owing to its size, wealth and relative remoteness, the United States was not hampered in development work to anything like the same extent.

These comments are made in no captious spirit born of envy. On the contrary, in the achievement of real pro-

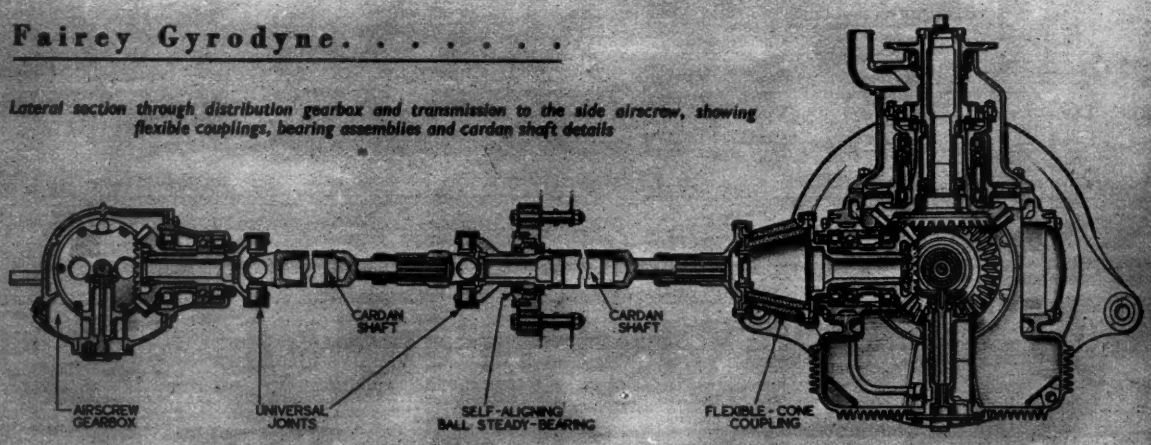
The, generously fenestrated and comfortable, cockpit is admirably laid out with fully duplicated primary controls consisting merely of columns, pedals and throttle levers.



gress in the helicopter field, this country can more than hold its own. It is worth remembering that one of our American contemporaries recently admonished its readers not to forget that they could still learn something from this country's helicopter work. Perhaps the most spectacular of British helicopter achievements was made with the aircraft which forms the subject of this article, the Fairey Gyrodyne, for on June 28th, 1948, in the hands of S/L. Basil Arkell, this aircraft established a new world's helicopter speed record at 124.3 m.p.h. In relation to this and the foregoing remarks about official support, it is all the more noteworthy to emphasize that this aircraft is a private venture by the Fairey Aviation Co., Ltd.

Fairey Gyrodyne. . . . . .

Lateral section through distribution gearbox and transmission to the side airscrew, showing flexible couplings, bearing assemblies and cardan shaft details



As a conception, the Gyrodyne originated just before the war to meet a naval requirement for a rotary-wing aircraft capable of operating from the deck of a ship, but owing to war's own exigencies, it was not until 1946 that development of the type really started. It should, perhaps, be explained that the fundamental principle of operation exploited in the Gyrodyne differs from the basic form used in other helicopters. The immediate difference is discernible in the use of an offset tractor airscrew instead of the lateral thrust airscrew carried on a tail boom in other types of single-rotor helicopter as a means of compensating torque reaction. Usually, the power distribution is to provide a maximum for the main lifting rotor and a minimum for the balancing rotor, but in the Gyrodyne, *par contra*, the power given to the main rotor is kept as low as possible and the remainder utilized for the credit purpose of forward propulsion.

Although a subsidiary quality of uniqueness in helicopter practice, the use of stub wings and of horizontal and vertical tail surfaces results in the Gyrodyne having a stable fuselage. The compactness of the aircraft belies, at first, the generous accommodation: forward of the leading edge of the "wings," the fuselage is wholly cabin. A useful idea of the degree of spaciousness is given by our cutaway drawing, and although some measure of the quality of appointment is also conveyed, the air of quiet comfort and unostentatious luxury which wraps about the traveller by Gyrodyne is something only to be appreciated by actual experience. On the score of capacity, perhaps one of the most useful forms which the Gyrodyne is likely to take is that of an ambulance. Two full-size stretchers can be accommodated, one above the other, on the starboard side of the cabin, access being afforded by splitting the nose on the vertical centre-line and hinging the starboard half to swing away. A seat is provided for a nursing orderly behind the pilot and adjacent to the heads of the stretchers. The level attitude of the Gyrodyne in flight is a further advantage in this instance.

Structurally, the fuselage of the Gyrodyne Mk. I is basically a braced-trusswork welded-skeleton of steel tubes to which the enclosing skin is applied in the form of panels, virtually all of which can be removed for accessibility. It is, however, planned to employ a monocoque structure for production versions of the aircraft. The wings are semi-monocoque structures, built up with two spars of extruded T-section booms and plate webs with pressed sheet chordal ribs and a single wrapped skin forward of the rear spar, the trailing edge being a separate sub-assembly. This relatively stiff structure is necessitated to cater for the thrust, drag and inertia loads of the offset airscrew to starboard and, of course, the drag and inertia loads of the complementary battery housing to port. Again, the existence of these strong appendages offered a first-class opportunity to provide the aircraft with a wide track undercarriage (10ft). Each of the oleo pneumatic telescopic struts—of Fairey manufacture—is anchored in a light alloy block through-bolted to extra-heavy chordal ribs, the head of the leg piercing the block core, which is countersunk top and bottom to provide seatings for annular cones on the leg, squeezed up by a ring nut threaded on the strut crown. A similar form is adopted for the nose-wheel strut which, incidentally, is furnished with a twin-track electrical conducting tyre. Leg travel is 12in for the main units and 10in for the nose unit, the undercarriage being designed to cater for a vertical velocity of 12ft/sec.

Tail Surfaces

A semi-monocoque structural form is also employed for the tail surfaces, but the material here is wood. Two box ribs of spruce booms and ply webs are used in conjunction with built-up chordal ribs and a plywood skin. The booms are continuous and are attached to the rear fuselage with two fork-and-lug fittings from the front spar, and a single-pin attachment at the base of the rear spar to the apex of a two-strut brace running down to the heel of the rear fuselage. The fins are of similar construction to the tail-plane and are attached to the ends of the spars with through-bolted machined fittings. The "elevator" is purely a trim tab, used in forward flight to adjust fuselage attitude, but as the rotor characteristics of the Gyrodyne are such that the fuselage is basically level in cruising flight, the tab is little used. The rudders are not normally used at all; to all intents and purposes, they are extensions of the fin surfaces, but in autorotation, with the tractor airscrew stopped, there is no positive directional control and, therefore, the rudders are available for use in this connection.

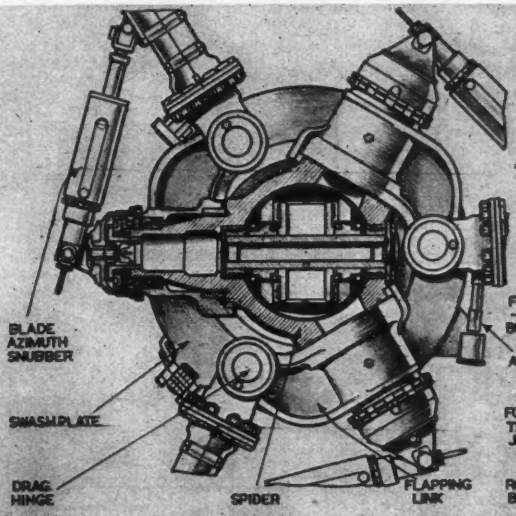
The Alvis Leonides which is used to power the Gyrodyne is not the helicopter version of that engine. It is the standard "upright" power plant housed with the crankshaft axis on the fore and aft centre-line of the fuselage. The

engine is dynaflex-mounted at nine points on the crank-case from a welded tubular ring carried, in turn, on a triangulated bracework of tubular struts running rearwards to the "longerons" of the airframe skeleton. At these points the rear fuselage is pin-jointed so that by removal of the port pins the whole rear portion of the fuselage can be swung away to starboard to allow withdrawal of the engine. Forward of the power unit, the distribution gearbox is carried at four flexible-mounting points in the bracework beneath the pylon, and the 50-gall. fuel tank is housed beneath the gearbox under a fireproof roofing. Control runs pass to starboard, and on the opposite side of the fuselage the cylindrical oil tank of 7 gall. capacity is housed almost vertically at the port quarter of the pylon.

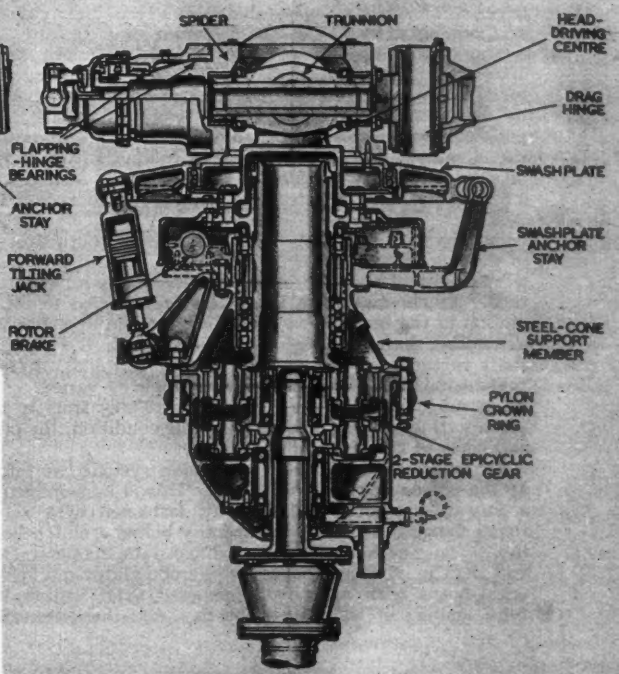
In place of the normal engine reduction gear-case, a cast cover plate is fitted which extends to the root diameter of the cooling fan. In this plate are mounted 12 radial aerofoil-section Tufnol distance pieces on the crowns of which the fan tip-shrouding is supported. These "spokes" are set at an angle to act as rectifying vanes for the fan airflow delivery. The fan itself comprises 25 Aeroplastic blades, riveted in a channel-section light alloy ring, flexibly-mounted with 12 Silentbloc bushes to the fan disc-plate.

The Leonides gives 520 b.h.p. at 3,000 r.p.m. at 6¼ lb/sq in boost. The output shaft is taper-splined to a disc coupling to which the fan plate is bolted, and from which six pins extend to the bushes of a Fairey-Silentbloc rubber/metal-bonded flexible coupling. The output side of this coupling is a short, high-tensile steel shaft, externally splined at its forward end to the bore of the input half of a second (similar) flexible coupling. This form of drive caters for any misalignment between engine and gearbox.

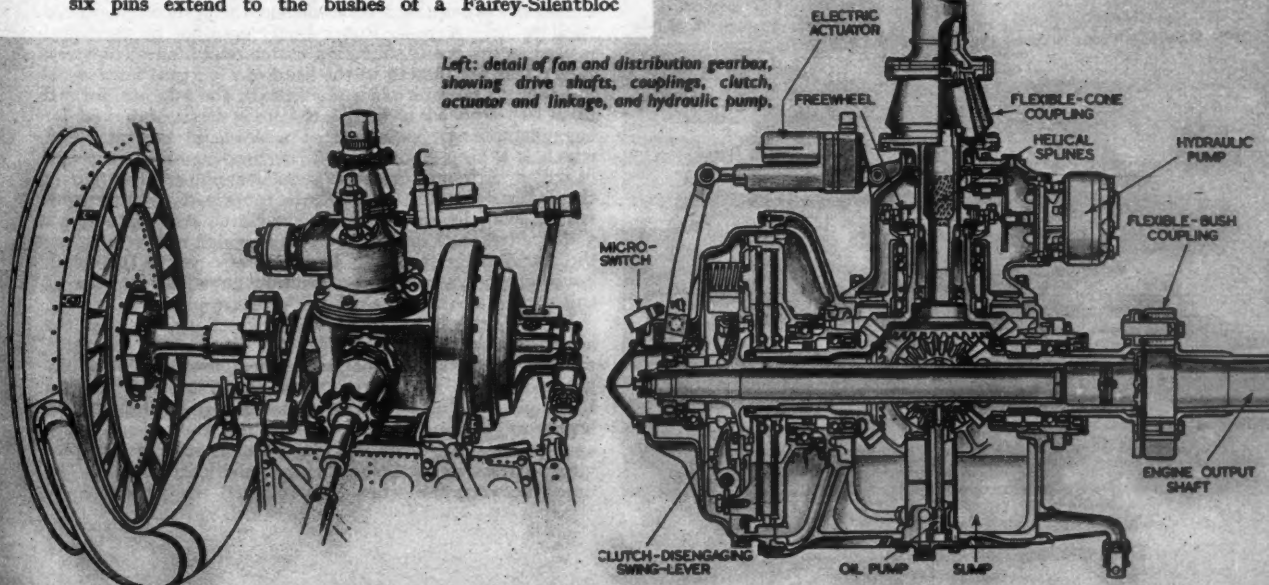
The driven element of the forward coupling is bore-splined to a bevel shaft meshing with a pinion to starboard whereby drive is given to the side airscrew. Whilst on the subject, it might be as well to deal with the detail elements of the airscrew drive before going on to tackle the main rotor transmission. The pinion accepting drive from the input bevel is hub-splined to a Fairey-Metalastik flexible coupling consisting of a truncated cone rubber/



Below is a longitudinal vertical section through the distribution gearbox, clutch, reduction gear and rotor head, whilst at left is a plan section of the head, illustrating the trunnion pivot and blade articulation



Left: detail of fan and distribution gearbox, showing drive shafts, couplings, clutch, actuator and linkage, and hydraulic pump.



metal-bonded sandwich, which is in turn rim-bolted to a transfer unit splined to a 2¼in diameter cardan shaft. This latter is supported in a Skefko self-aligning ball bearing carried in a rubber-bushed mounting housed in the wing.

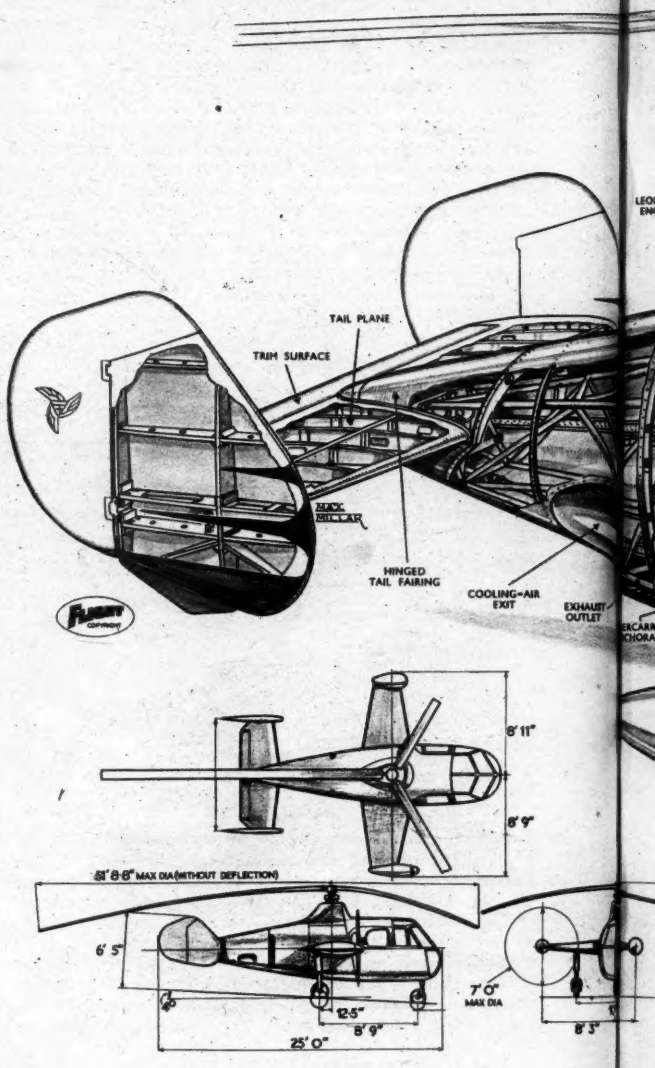
On the outboard side of the Skefko bearing the cardan shaft is broken to accommodate a Hardy Spicer universal joint, the shaft then continuing outboard through a splined sliding joint to a second H-S universal. The output side of the latter is a coupling shaft splined to the bore of a bevel pinion through which right-angle drive is given to the bevel carried on the tail of the airscrew shaft. This is a standard No. 2-size component, running in a roller and ball bearing assembly at the tail, and in a roller bearing at the nose of the cast magnesium gearbox. The base of this gearbox is used as an oil tank, the gear-type oil pump being housed centrally therein and bevel-driven from a subsidiary pinion fitted in the mouth of the airscrew shaft

Fairey Gyrodyne. . . . .

bevel. Oil feed is given to the main bevels and bearings, and, via an external pipe, to the front shaft bearing.

The tractor airscrew is a special unit of Fairey design and manufacture (type CP/2/H/2/48) employing two metal blades, the pitch of which is mechanically changed by displacement variation of the "rudder" pedals. The push-pull rods from the pedals convey control motion to the integral valve of a double-acting hydraulic jack carried in a box on the after face of the rear spar, immediately outboard of the starboard undercarriage anchorage. The jack rod is pin-jointed in the box, the head of the jack being pivoted to a swing link hinging at the outboard end of the box. The outer end of the link is pinned to a spanwise push-pull rod, pin-jointed at its outboard end to a rack. Linear motion of the rack is transferred to rotary motion in the rack pinion carried on the end of a forward-extending shaft running coaxially through the airscrew shaft to the epicyclic gear at the airscrew hub, through the medium of which blade pitch angle is varied. The pitch range used at the moment is 18 deg from a fine pitch setting of 5 deg; for the hovering condition, the pitch setting is of the order of 13 deg.

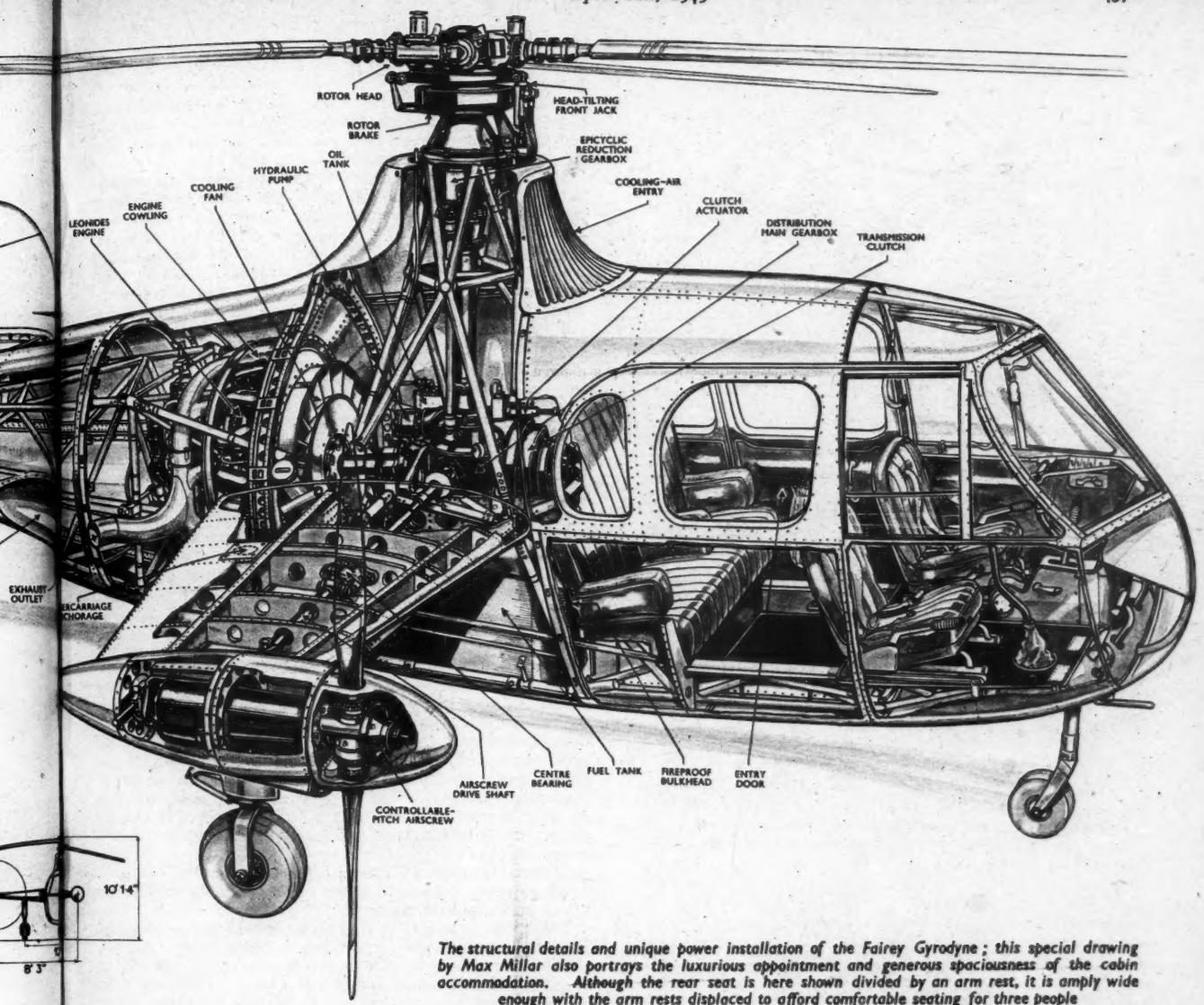
To revert to the main transmission system, we left it at the engine output bevel shaft. This is bore-splined to a forward-extending hollow shaft, fashioned with an integral flange to which is peripherally bolted a clutch housing. The clutch itself is a modified 14in diameter Borg and Beck unit, incorporating two Ferodo plates and held in engagement with 15 radially disposed axial springs, the total loading of which is 1,160 lb. A rather interesting



Complementing the cut-away drawing above, this photograph of the Gyrodyne clearly shows the workmanlike and immaculate appearance of the aircraft

system of clutch operation is employed in order to provide a smooth take-up, and very efficient the system has proved itself to be. A 70-lb Rotax linear actuator of 3in travel is used as the power source for clutch operation. The screw jack rod is pin-jointed to the head of a vertical lever rocking about a fulcrum pin and, beneath the fulcrum, formed as a two-pronged fork. Each prong is itself forked for engaging pins at each side of a sleeve in the mouth of which is a deep-groove ball thrust bearing, the inner race of which surrounds an angle-section annulus. The face of this latter component engages the inner pads of three equi-spaced swing levers pivoted on the clutch housing to give a 5 to 1 advantage on the outer pads which engage a lip on the clutch pressure plate. In the front cover of the clutch housing are embodied the reaction cups housing the 15 coil springs bearing against the pressure plate.

In brief, the action of the clutch mechanism is that the actuator extends to disengage the clutch, the extension causing the fork ends of the vertical lever to move the sleeve forward, this, through the thrust bearing, moving the angle annulus to thrust against the pads of the swing levers, so that the outer pads withdraw the pressure plate against the spring load. A refinement is embodied to provide progressive engagement and to eliminate snatch. The union between the screw jack rod and the vertical lever



The structural details and unique power installation of the Fairey Gyrodyne; this special drawing by Max Millar also portrays the luxurious appointment and generous spaciousness of the cabin accommodation. Although the rear seat is here shown divided by an arm rest, it is amply wide enough with the arm rests displaced to afford comfortable seating for three people

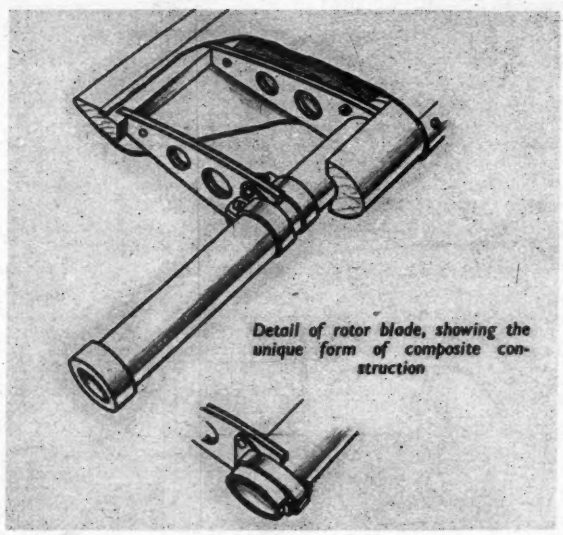
is in the form of a cup carried on the end of the rod, in which a coil spring bears against the base of a reversed, enclosing cup, pin-jointed to the vertical lever. As the actuator extends, the spring is compressed until the inner cup bottoms on the outer cup, after which further extension swings the lever to disengage the clutch.

For giving smooth clutch take-up on engagement, as the actuator starts to contract, the cup assembly follows uniformly as a whole, until the clutch plates start to engage. As the plates are progressively more heavily loaded, the inter-cup spring extends until, at its limit, the main clutch springs are exerting their full pressure and the clutch is fully engaged It is essentially a matter of balancing the inter-cup spring exertion against that of the clutch springs themselves, by means of the mechanical advantage given through the fulcra. It is also worthy of note that, on the vertical lever is fitted a stop lug which, when the clutch is disengaged, actuates a switch in the starter circuit: thus the engine cannot be started with the clutch engaged.

Both Ferodo plates are carried on discs, splined to the shaft of the 26-tooth main driving bevel, meshing with the 32-tooth vertical bevel through which torque is given to the rotor shaft. Between bevel and shaft, however, is interposed a rather clever freewheel device in the form of a modified Sinclair synchromesh coupling. The bevel shaft is splined to the bore of a stemmed-cup member in the upper mouth of which is bolted an internally toothed ring which forms the driving member of the freewheel assembly.

Coaxially within the bevel shaft is housed a coupling shaft in roller and ball bearings, this shaft being cut with helical splines for engagement with the sleeve carrying a ring of external teeth. On the sleeve are four pawls which engage teeth on the outer ring so that, as drive is given to the latter, it is transmitted via the pawls to the sleeve, which then rides up the helical splines to bring the external teeth on the sleeve into engagement with the ring of internal teeth. Full tooth pressure cannot, however, be imposed until the sleeve has risen up against its stop abutment above the splines. Immediately engine power is shut off, the sleeve drops on the helical splines, and the inner/outer teeth are taken out of engagement, so enabling the rotor to freewheel, or autorotate.

The upper part of the coupling shaft is splined to a truncated cone flexible coupling similar to that used in the airscrew drive, and beneath this is also splined a bevel ring for drive take-off to the Lockheed Mk VI hydraulic pump mounted at the rear of the gearbox crown. (The drive for the rotor tachometer generator is taken off the pump drive, whilst that for the engine tachometer is taken off the end of the clutch driving shaft.) By arranging that the



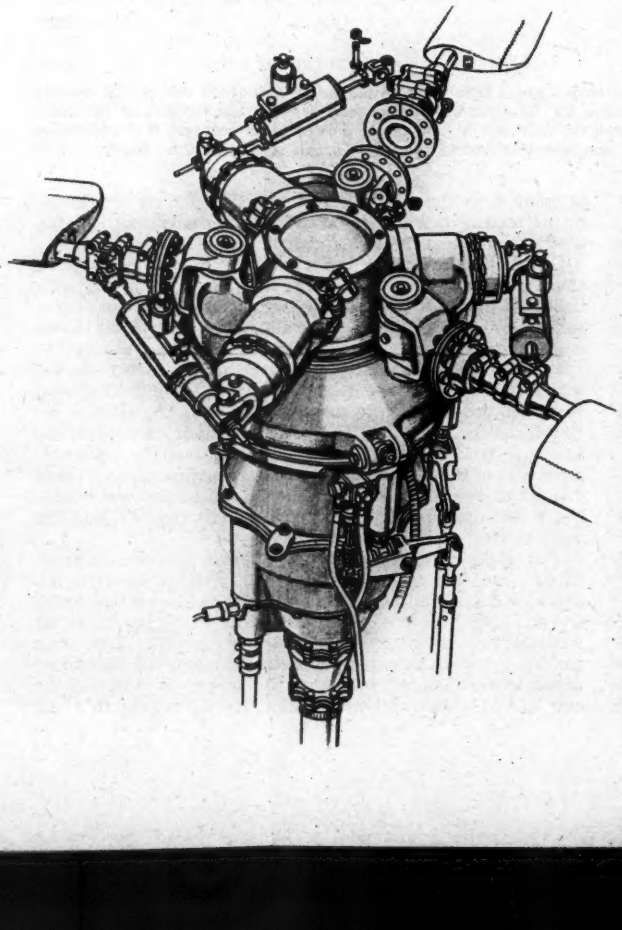
Detail of rotor blade, showing the unique form of composite construction

Fairey Gyrodyne. . . . . .

pump is driven from the rotor shaft, fluid delivery to the rotor control jacks is ensured in the event of engine failure.

For torque transmission to the rotor, the shaft used is of 3in diameter and 13 gauge wall thickness, surmounted by a further conical flexible coupling, the output member of which is splined to the bore of the reduction gear input shaft. This runs in a ball-thrust and roller-journal bearing assembly and is fashioned integrally with the spur sun-wheel of the first-stage epicyclic reduction gear train. It will be remembered that the engine crankshaft/rotor-shaft reduction is 0.813:1 (26/32), and this is further reduced through the compound epicyclic gear in the ratio of 0.0933:1, each epicyclic stage giving a reduction of 0.3055:1. By virtue of the fact that the major order of reduction is made immediately beneath the rotor head, the torque loading in the transmission is kept reasonably low.

Detail of rotor head assembly, showing flapping and drag linkage form, swashplate-jack and azimuthal snubber-units



Each epicyclic stage consists of six planetary pinions reacting against a common annulus, the carrier of the first-stage planets being toothed to the second-stage sun-wheel in the form of a sleeve running on a pair of ball races on the main input shaft. The carrier of the second-stage planets is the skirt of the rotor hub shaft. This runs in roller bearings top and bottom with twin ball-thrust bearings, the full bearing stack being carried in a steel cone member, the skirt of which is bolted to the steel-tube ring at the crown of the pylon. The epicyclic reduction gear box, a magnesium casting, is commonly bolted in conjunction with the steel cone to the pylon crown ring.

At the head of the hub shaft is splined a flanged sleeve to which is bolted the rotor brake drum. Although essentially similar to the normal twin-shoe Lockheed hydraulic expanding brake in common use on many British cars, the rotor brake is of light alloy construction, with the rather interesting detail modification that the drum tread is of sprayed cast iron. Especially thin Ferodo shoe linings are employed and the brake anchorage plate is bolted direct to the steel cone member, whilst also serving to support the anchor stay for the swashplate.

Head Articulation

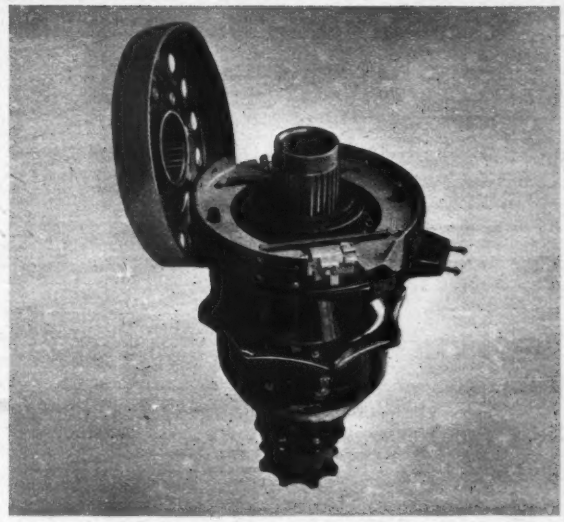
In order to furnish a means both of concentric location for, and torque transmission to, the rotor head assembly, the flanged sleeve carrying the brake drum is formed with a number of radially disposed taper splines, flanking the eight bolts which unite the head to the sleeve. The joint is actually made to what can perhaps best be described as the head driving centre, a fork-crowned pedestal, to which the three-armed blade-carrying spider is trunnion pivoted. Spanning the fork of the driving centre is a hollow pin running in needle roller bearings, and through this pin, at 90 deg, is in turn carried a second (smaller-diameter) pin supporting the spider, also on needle roller bearings. Duplex ball thrust bearings are interposed between spider, pins and driving centre fork, so that the whole assembly articulates about an instantaneous centre.

The spider is a D.T.D. 306 high-tensile steel forging, on the three arms of which the blade flapping hinge links are needle-roller pivoted. A ball thrust bearing on the end of each arm accommodates radial thrust loads. Flapping links are S.11 steel forgings, curved in plan so that the blade axis through the drag hinge to the hub centre makes an angle of approximately 60 deg with the flapping hinge axis. The root skirt of each flapping link is recessed to afford stops for coning and dropping limits of blade movement. A rather clever little arrangement of centrifugal bobweights is incorporated, so that, at above 85 rotor r.p.m., the weights fly out and allow the blade full flapping freedom—within the stop limits. Below 85 r.p.m., however, the bobweights fall inward and stopping distance pieces are inserted so that the blade roots cannot drop below the horizontal. Blade flexure in bending is, nevertheless, such as to give a tip droop of the order of 30in.

At the "free" end, each flapping link is formed as an eye to accommodate a D.T.D. 306 nitrogen-hardened hollow pin. The ends of this pin are surrounded by steel-backed, lead-bronze, diamond-bored bearings, pressed into the bores of the fork-ended S.11 blade carrier. A duralumin sleeve is located inside the hollow pin and is capped top and bottom to locate the whole assembly endwise, and to afford oil-tightness. The blade carrier has a flange with clearance holes for the through-bolts from the mating flange of the blade root adaptor, so allowing 2½ deg of blade pitch adjustment. The adaptor is longitudinally split on its diameter and is ground-bored to mate with the ground diameter of the blade spar shank, these components being pinched together by a series of tangential bolts.

Blade structure is interesting in that, as previously noted,

Epicyclic reduction gear with upper stage displaced



Detail of hydraulic expanding twin-shoe rotor brake

the blades are quite flexible in spanwise bending, but are extremely stiff both in torsion and in drag-induced bending. Another somewhat interesting aspect of structure is that the blades are built up on a completely unperforated D.T.D.254 hollow steel spar, which is of circular section for the inboard 80in of its length, thence changing to an elliptical section of constant chord and depth out to the tip. The consonant aerofoil sections are N.A.C.A. 23022 inboard and N.A.C.A. 23015 outboard, the chord remaining constant throughout blade span. Spruce, birch-faced plywood-sandwich chordal ribs are spaced at 4in centres, each being attached to the spar with an enclosing clip, bolt-tensioned in the case of the circular section spar root, and wedge-tightened for the elliptical section span. Blade covering is made with a $\frac{1}{16}$in three-ply birch skin, attached to a spruce trailing edge block and a mahogany leading edge block which is armed with a flush-fitting brass sheath.

Control and Blade Action

Reverting to the rotor head, on the underside of the spider is bolted the swashplate carrier with a two-row peripheral ball bearing to the cast D.T.D. 133 light alloy swashplate annulus. This latter does *not* rotate, being held, through a ball/socket-ended connecting strut, to the anchor stay off the rotor-brake back plate. On the fore-and-aft centre-line of the aircraft and at 90 deg to port, the swashplate is double-universally pivoted to the heads of a pair of actuating jacks, the forward unit giving plus and minus 6 deg fore/aft tilt, and the port unit giving plus and minus 5 deg lateral tilt. The bases of the jacks are double-universally pivoted to brackets carried at the base of the rotor supporting cone through to the pylon ring, and at the head attached to the brake back-plate. Motion at the instigation of individual or combined jack movement is imposed on the swashplate to tilt the whole head about the pivotal centre of the trunnion, and so bring about pitch-change of the rotor blades. Before examining the manner in which this occurs, however, the physical control system employed should be appraised.

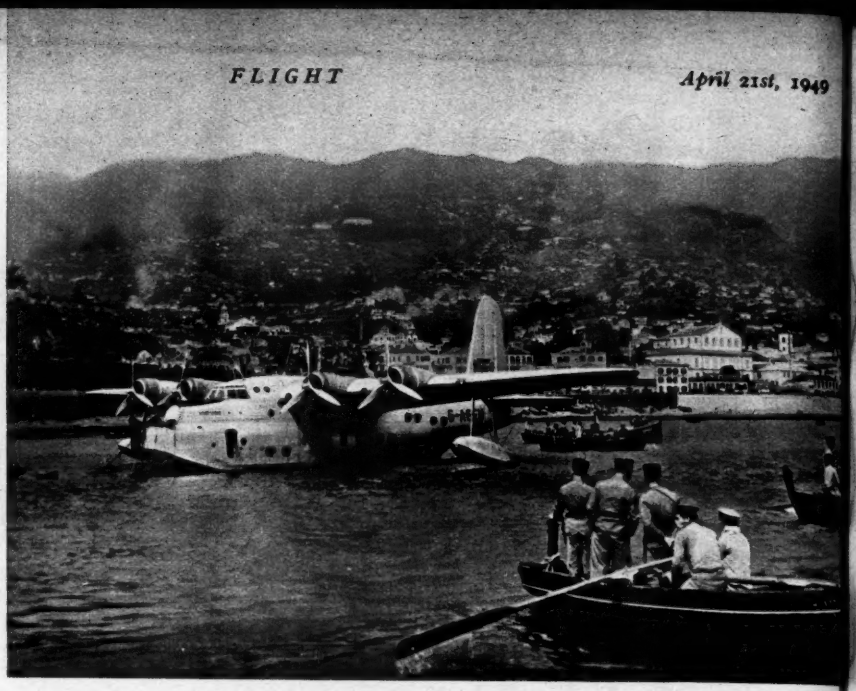
From the control columns in the cockpit, push-pull rods transmit motion to a pair of swing links, each one of which serves a head jack. From the swing link, a connecting strut is universally pivoted at the foot and ball/socket jointed at the head to the rod of the jack actuating valve; the latter is an integral element with the jack itself. Thus, movement of the cockpit control columns results in movement of the control valves, so directing appropriate oil flow to the jacks to give the required movement. The fact that the valve body is integral with the jack cylinder results in automatic follow-up.

So many designers have followed the example of Sikorsky in using direct application of collective and cyclic pitch that this system has come to be regarded virtually as orthodox helicopter control practice. Perhaps due to his background experience with the Cierva Autogiro, however, Dr. J. A. J. Bennett, who heads the Fairey helicopter design team, has favoured a tilting head system for the Gyrodyne, in many ways reminiscent of that used for the various Autogiros. There is no direct application of cyclic pitch control to the Gyrodyne rotor blades, the pitch being altered cyclically purely as a function of head tilt. That is to say, as each blade is attached to the head at a fixed angle of incidence, the fact of tilting the head in any one direction will lead to the blade angle of attack being reduced as the blade rotates towards the direction of tilt, or "downhill," and increased as the blade rotates away from the direction of tilt, or "uphill." The tendency is, of course, for the blade tip-path plane to remain parallel with the plane of the head; but when the head is tilted, the blade tips will lag and will follow a roughly helical path until they once more rotate in a plane parallel to the tilted head. This they do by virtue of the flapping linkage.

The collective pitch effect is, perhaps, slightly more difficult to understand. As mentioned, each blade is set at a given angle of incidence in the static case, the blade axis being disposed approximately at an angle of 60 deg to the axis of its flapping hinge, this angle being termed the delta angle. A moment's consideration will make it clear that, as the blade varies its position in azimuth, the blade pitch must necessarily change accordingly as the delta angle increases or decreases. Thus, if the aircraft is imagined as hovering, and the pilot desires to increase height, he merely raises the throttle lever which increases the boost, and thus the power output of the engine, so applying greater torque to the rotor. When this takes place, the blades tend naturally to lag (swinging about their drag hinges) so increasing the delta angle, and thus their pitch, to bring about an increase in lift. The cone angle of the rotor disc is, of course, a function of the lift and centrifugal forces imposed on the blades.

To balance the forward thrust of the airscrew at zero forward speed, the rotor tip-path plane is so arranged as to be inclined backward, so that the rearward component of the thrust vector affords compensation.

Forward flight is achieved by decreasing the rearward inclination of the rotor tip-path plane and, in point of fact, it is not until a fairly high forward speed has been reached that the tip-path plane becomes horizontal. The normal operating condition of the Gyrodyne is, therefore, with both the fuselage and tip-path plane substantially level; a material advantage not only in rotor aerodynamics but also in pilot and passenger comfort. C. B. B-W.



The Hythe, Hampshire, in Funchal Bay. It was the first commercial and largest aircraft to visit the island.

Madeira by Air

Impressions of a Survey Flight in a Hythe of Aquila Airways' Fleet

By a Passenger

A BEAUTIFUL but little-known volcanic island, Portuguese-owned and having some 250,000 inhabitants, Madeira is about the same size as the Isle of Man. No aircraft so big, graceful or commercially significant as our Hythe had ever before landed there; even so, as we came down to alight in Funchal Bay with the hills stretching up steeply from the shore, we were surprised to find the parades, piers and jetties black with people. It happened to be a public holiday and thousands of islanders had turned out to greet us.

The reasons for this unexpected enthusiasm were not far to seek, for ours was the first civil aircraft ever to visit the island, and we were the first civilians to arrive at Madeira by air. The island, which lives chiefly by tourists, is vastly excited about its projected air link with Lisbon and London, and all that this means in the way of increased tourist trade. Another cause for excitement we brought with us—namely, Madeira's first air mail. It is, perhaps, no wonder then that the leading daily newspaper, *Diaro de Noticias*, gave up the whole of its front page, and more, to recording our arrival. They had been nothing like as generous with their space, I was told, when a week or so earlier a British aircraft carrier had called in.

The only other aircraft remembered to have landed at Madeira were a Junkers floatplane many years ago and, more recently, a small French military flying boat. Aquila Airways, Ltd., the British charter company, now plans to operate a regular service with its Hythe flying boats between Southampton and Madeira, either direct or by way of Lisbon, which lies almost on the great-circle course between these two places.

The Aquila fleet of twelve Short Hythes is the largest of a single type in private ownership anywhere in the world. There seems every likelihood that the company will be licensed as an associate of British European Airways to operate this regular service, probably beginning early next month. By this time the winter cruises arranged by the Bergen Steamship Company from Southampton to Madeira will have ceased. A direct service by flying boat will take nine hours as compared with three-and-a-half days on the surface. The proposed return fare by air, with luxury-style 22-seat accommodation, is £87 10s, while by ship the cost ranges from £68 to £140. From Lisbon to Madeira the return fare is likely to be £35, a figure which, if a 51-seat layout is arranged, could be reduced to £25.

I was privileged to accompany W/C. Barry Aikman, D.F.C., chairman and managing director of the company, Mrs. Aikman, and two directors, Mr. Harold Rattle and Mr. Geoffrey Howland-Jackson, on this successful survey flight over the route

* *Mr. Courtenay Edwards, who has specially recorded his impressions for "Flight."*

Madeira By Air . . . . .

of 3,120 miles in the flying boat *Hampshire*, G-AGEU.

On the flight, which lasted six days, from March 24th to 29th, the Hythe was piloted by Captain Douglas Pearson, Aquila's senior pilot. The other members of the crew were: First Officer R. J. Clark (navigator); Second Officer M.C.M. Blackburn; Senior Engineer Officer J. H. Stewart; Radio Officer P. Worrell. In addition we had three hostesses, though I gather that W/C. Aikman intends to employ stewards on the actual service. Capt. Pearson handled *Hampshire* magnificently throughout and showed that, provided the swell is not too pronounced, Funchal Bay makes a good alighting place. It certainly caused no anxiety for our experimental touch-down. A bigger sea was running two days later for our departure but, although we had to take-off directly against the swell, it again caused no trouble.

Possible Landing Places

Madeira's swell has been one of the main worries in planning the new service. However, enough was learned during the visit for Barry Aikman (who, incidentally, is an ex-Coastal Command pilot) to feel confident that there need be little interference with the regularity of a scheduled service. Before touching down in Funchal Bay and taxying to moorings in the lee of the harbour wall, we made a low-level recce of possible alternative landing places around the island. It seems that the bay of Porto da Cruz, off the north-west coast, might be one suitable alternative, though Machico Bay, south of the tongue of land at the island's eastern extremity may prove to be the best. In any case Aquila skippers will have a wide choice of alternatives if they deem it inadvisable to put down at Madeira at all. They can return to Lisbon (522 nautical miles) or go to Las Palmas (250), Gibraltar (613), Azores (530), Bordeaux (1,000), or Port Lyautey, West Africa (525).

As there are as yet no refuelling facilities in Madeira it is necessary for the time being to take on sufficient fuel at Lisbon for both out and return journeys, together with a suitable reserve. We took off from Lisbon with 1,900 gallons, and when we touched down on the River Tagus on return to Lisbon we still had 560 gallons in hand.

Naturally a careful record was kept of the fuel consumption on the survey flight. Allowing 50 gallons for take-off the figure for the first leg from Southampton to Lisbon was 0.859 a.m.p.g. (naut.). This figure would have been higher had we not deliberately hung on our props for about half an hour at the end of the journey in order to make an impressive on the dot touch-down at the scheduled time. With the same take-off allowance the figure from Lisbon to Madeira was 0.767 a.m.p.g. This again was not entirely representative, because, due to a slightly delayed take-off, it was necessary to do some fast cruising to make up time. On return, between Madeira and Lisbon, a figure of 0.850 a.m.p.g. was recorded, and the last figure of which I took note as we approached Southampton from Lisbon was 0.942 a.m.p.g. It is 835 nautical miles from Southampton to Lisbon via Cape Finisterre and 522 nautical miles from Lisbon to Funchal. Our complete log was:—

March 24:
Southampton: Airborne 0910 hr. Set course 0912.
Lisbon: Overhead 1517. Waterborne 1531.
Average ground speed, 137 kt (158 m.p.h.).
Average true air speed, 128 kt (147½ m.p.h.).

March 25
Lisbon: Airborne 0940. Set course 0944.
Madeira: Overhead 1325. Waterborne 1402 (After flying around Porto Santo and Madeira Islands.)
Average g.s. 139 kt (160 m.p.h).
Average t.a.s. 143 kt (164.5 m.p.h.).

March 27:
Madeira: Airborne 1315. Set course 1325.
Lisbon: Overhead 1657. Waterborne 1706.
Average g.s. 145 kt (167 m.p.h.).
Average t.a.s. 142 kt (163½ m.p.h.).

March 28:
Lisbon-Southampton.
Average g.s. 141 kt (163 m.p.h.).
Average t.a.s. 137 kt (158 m.p.h.).

Customs and immigration formalities at Lisbon and Funchal took no longer than one would expect on a survey flight. As we came down on to the swift-flowing Tagus a launch crowded with uniformed officials was waiting near our mooring point and its occupants clambered aboard in such numbers that Capt. Pearson must have begun to wonder about his Plimsoll line. A quick customs check was made on board and we were taken by launch to a nearby jetty where a number of British and Portuguese officials were waiting to greet us. They included W/C. Cecil Garton (British Air Attaché at Lisbon), Mr. Peter Edwards (B.E.A. manager in Portugal), Col. Esdeves Beja and Major Sergio da Silva (commandant and deputy commandant of Portela, Lisbon's airport) and Mr. Tomas Pinto Basto (Aquila's chief representative in Lisbon).

The journey into Lisbon was made in a coach belonging to C.T.A. (Companhia Transportes Aeros) who are acting as handling agents for Aquila in Lisbon. Later we met Mr. Carlos Blech, pioneer Portuguese pilot and chief executive of C.T.A., who told me his company are hopeful that the Portuguese Government will hand over to them the operation of the nation's internal and external airlines, at present run on a restricted scale by the Air Force.

Aquila Airways' agents at Madeira are Blandy Bros. Mr. Walter Blandy, one of their chief London representatives, flew with us to Funchal. Blandy Bros. had, for Aquila's benefit, installed radio in one of their launches at Funchal. Our radio officer told me he had been able to make W/T contact with Funchal station very soon after taking off from Lisbon.

We had nine extra passengers on the flight to Madeira, including Mr. Malcolm Henderson (Counsellor to the British Em-

HAMPSHIRE *in Funchal bay. There is a clear expanse of water for landing and take-off, but a heavy Atlantic swell and the hills in the background can make conditions difficult.*

Madeira by Air . . . . .

bassy and Consul-General), Dr. Amorim Ferreira (head of Portugal's national meteorological service), Mr Pinto Basto and Dr. A. Figueria (Governor of the Portuguese port of Setubal, a diversionary marine air terminal). Col. Lobo da Costa, Governor of Madeira, came along from Lisbon to our distant Tagus mooring to see us off on our way to Funchal.

Lavish hospitality awaited us at Funchal. Mrs. Cary Garton (mother of W/C. Garton), who has long agitated for an air service to Madeira, was particularly kind. Other leading Funchal personalities who showed generous interest in the Aquila project included Dr. Jose Leite Monteiro (Acting Governor), who paid an official visit to the *Hampshire*, Brigadier Silva Braga (Military Governor), Commander Voso Camacho de Freitas (Captain of the Port), Dr. Bastos Machado (Mayor), Mr. Bryce Nairn (British Consul in Madeira) and Mr. Graham Blandy.

Two of many incidents indicating the island's delight at the prospect of an air service should be quoted. On our first night at Funchal diners at the smart Savoy Hotel stood and applauded the uniformed crew of the *Hampshire* as they walked across the dance floor to their tables. When Barry Aikman went to pay the bill on the morning we left, the hotel manager told him: "Sir, there is no bill. You are our guests. We have been delighted to have you."

EASTER MONDAY AT ELSTREE

Air-Display Season Opens

BRILLIANT sunshine and summer-like temperatures drew an enthusiastic crowd of spectators to the air display at Elstree on Easter Monday, organized by the United Services Flying Club in aid of the Soldiers', Sailors' and Airmen's Families Association.

The flying programme started at 1100 hr with the eliminating rounds for the bombing competition by members of the club This curtain-raiser was followed by three Auster Vs flying in formation and at 1230 Mr. Dudley Hiscox gave a demonstration of soaring in a Chilton Olympia sailplane. By this time the morning's fresh breeze had strengthened, but, although the sun disappeared for some time during the afternoon, the weather remained fine.

The afternoon programme was started at 1415 hr with a second demonstration of soaring in the Olympia, followed by more formation flying by the Auster Vs. F/O. Twyman, of No. 1 Reserve Flying School, Panshanger, performed solo aerobatics in a Tiger Moth, showing just how a club aircraft should *not* be flown by amateurs, and landed as a Newbury Eon took off with an Eon Olympia in tow. On reaching a height of some 1,500ft the Olympia cast off and after soaring, diving and turning for some ten minutes, made the characteristic approach and landing of the high performance sailplane.

Three Tiger Moths, flown by R.Aux.A.F. pilots of No. 1 Reserve Flying School, demonstrated close-formation flying over the airfield, and then S/L. Ranald Porteous put through its paces the Auster Autocrat fitted with the Goodyear self-aligning undercarriage; the pilot amply proved its cross-wind-landing capabilities by landing off a stalled turn across wind—in fact, practically down-wind.

Attention was diverted from the smaller aircraft at this stage by the arrival of three Superfortresses of the U.S.A.F. Three times these impressive aircraft flew in low over the runway, then, as they flew off towards the east, F/O. Twyman took up his Tiger Moth again; but he retired to a discreet distance as the bombers turned and came in for a final run and banked steeply over the hangar before flying away, leaving the field clear for the Tiger Moth's aerobatics.

Towed by an Auster V, Mr. F. Marmol, who recently attempted to break the world gliding endurance record, flew a Zlin sailplane. While he was attaining sufficient height, a D.H. Rapide, with the door removed, took off for a triple parachute descent by Messrs. Owen, "Apex" and Rawling. The commentator promised a surprise, but unfortunately all three parachutes landed in a field about a mile away and nothing more was seen until two parachutists tramped on to the airfield about an hour later, carrying their opened parachutes; the identity of "Apex," therefore, remained, for the time being, a mystery.

Meanwhile, the Zlin sailplane had gained sufficient height and cast off, losing height slowly at first and then being put through an impressive series of evolutions until, after a steep dive, its pilot made a nicely judged landing. Six Spitfires of No. 604 R.Aux.A.F. Squadron, under the command of S/L. T. Lofts, D.F.C., appeared and performed air drill, after which they peeled off, dived across the airfield and then flew off home in formation to North Weald.

The flying programme ended with the final of the bombing competition, in which a number of Austers and one Piper Cub took part. The competition was won by Cmdr. Nelson, U.S. Navy, flying a Piper Cub. The flying programme ended at 1800 hr, but Rapides were occupied until dark with joy-riding.

GYRODYNE ACCIDENT

IT is with deep regret that *Flight* has to record the loss of the Fairey Gyrodyne and the consequent death of Mr. F. H. Dixon, who, with S/L. B. H. Arkell, has done the makers' helicopter development flying; Mr. Derek Garroway, flight observer, also lost his life. The accident occurred last Sunday, at Ufton, near Reading. No details as to the possible cause are available at the time of writing.

"Dickie" Dixon, who was 37 years of age, served in the R.A.F. from 1933 to 1936, was appointed assistant test pilot to the Fairey company in the latter year, and was chief test pilot from 1942 to 1946; he has since been largely concerned with the firm's helicopter programme, and with the introduction here of the Primer trainer and Juniors.

When the accident occurred, Mr. Dixon was making final flight trials preparatory to an attempt, scheduled for last Tuesday, to establish a 100-km closed-circuit helicopter record. It will be recalled that last June the Gyrodyne set up a new world's speed record of 124.3 m.p.h. over a 3-km straight-line course, and it was confidently expected that the new record would be made at a slightly higher average speed.

The machine which was lost was the prototype; another, the passenger demonstration model, exists. A detailed description of the Gyrodyne appears elsewhere in this issue.

FORTHCOMING EVENTS

April 21st.—Royal Aeronautical Society: "High Lift Devices and their Use," R. R. Duddy, A.F.R.Ae.S.
April 21st.—R.Ae.S. (Gloucester and Cheltenham): Annual General Meeting. Followed by film "Atomic Physics," at Gloucester.
April 26th to 28th.—R.A.F. Golfing Society: Spring Meeting at Berkshire Golf Club, Ascot.
April 27th.—R.Ae.S. (Weybridge): "Present Day Problems in Safety Requirements," W. Tye, O.B.E., B.Sc., F.R.Ae.S.
April 28th.—Royal Aeronautical Society: The 37th Wilbur Wright Lecture. "The Aeronautical Research Scene—Goals, Methods and Accomplishments," Dr. Hugh Dryden, F.R.Ae.S.
April 28th.—R.Ae.S. (Coventry): Annual General Meeting and film.
April 28th.—R.Ae.S. (Manchester): "Rocket Propulsion and Interplanetary Flight," A. V. Cleaver, A.R.Ae.S.
April 29th to May 15th.—Paris Aero Salon.
April 30th.—No. 613 (City of Manchester) Squadron and A. V. Roe Ltd.: Air Display at Woodford airfield.
May 2nd.—R.Ae.S. (Derby): "Lubrication of Aero Gas Turbines," J. G. Dawson, B.Sc., A.F.R.Ae.S.
May 3rd.—R.Ae.S. (Graduates and Students): "Notes on Fighter Development, 1936 1948," J. K. Quill, O.B.E., A.F.C.
May 4th.—R.Ae.S. (Luton): "Some Flying Experiences," Lt. Cdr. E. M. Brown, O.B.E., D.S.C., A.F.C., M.A., A.F.R.Ae.S., R.N.
May 6th.—Scientific Instrument Manufacturers' Association: Annual Dinner and Dance, May Fair Hotel.
May 7th.—Royal Air Force Rowing Club: Annual Regatta, Reading.
May 8th.—Royal Aeronautical Society: Garden Party.
May 12th.—R.Ae.S. (Graduates' and Students' Section): "Pressure Cabins," D. Cardwell, B.Sc., A.C.G.I., A.F.R.Ae.S.
May 18th.—R.Ae.S. (Weybridge): Branch Members' Junior Prize Lecture.
May 21st.—Northamptonshire Aero Club: 21st Anniversary Air Display.
May 21st.—Aero Golfing Society: Summer meeting and "Flight" Trophy, Ashridge Course.
May 26th and 27th.—National Physical Laboratory: "Open Days" May 26th for representatives of industrial organizations and May 27th for members of university staffs and government departments.
May 28th.—Wolverhampton Aero Club: "At Home" and Air Display.
May 29th.—Ultra Light Aircraft Association: Air Rally, Derby Airport.

(1) Mr. W. S. Farren, C.B.E., F.R.S., F.R.Ae.S.; Mrs. Watts, Dr. H. C. Watts, M.B.E., D.Sc., M.Inst.C.E., F.R.Ae.S.; Mr. N. E. Rowe, C.B.E., B.Sc., D.I.C., F.R.Ae.S.; Mr. S. Scott-Hall, A.C.G.I., M.Sc., D.I.C., F.R.Ae.S.

(2) Mr. A. G. Elliott, C.B.E., M.S.A.E., F.R.Ae.S., Dr. H. J. Gough, C.B., M.B.E., F.R.S. and Mrs. Gough. (3) Lady Sempill, Lord Sempill, A.F.C., F.R.Ae.S., and Mrs. Roxbee Cox.

CHARTER CELEBRATION

Dinner at Royal Aeronautical Society to Celebrate Incorporation

(4) Mr. P. Masefield, M.A., F.R.Ae.S. (nearly obscured) and Mrs. Masefield being received by Dr. and Mrs. Roxbee Cox. (5) Mr. W. S. Farren, Col. W. C. Devereux, F.R.Ae.S., and Mrs. Devereux. (6) Air Chief Marshal Sir Frederick Bowhill, G.B.E., K.C.B., C.M.G., D.S.O., with Lord Sempill. (7) Sir Frederick Handley Page, C.B.E., F.R.Ae.S., Mr. G. S. Lindgren, M.P. and Sir Richard Fairey, M.B.E., F.R.Ae.S.

(8) Mrs. Rowe, Mr. N. E. Rowe, C.B.E., B.Sc., D.I.C., F.R.Ae.S. and Capt. C. F. Uwins, O.B.E., A.F.C., F.R.Ae.S. (9) Lady Robinson, Sir Ben Lockspeiser, M.A., F.C.S., F.R.Ae.S., and Sir Robert Robinson, F.R.S., M.A., F.R.I.C., Hon. D.Sc., Hon. LL.D.

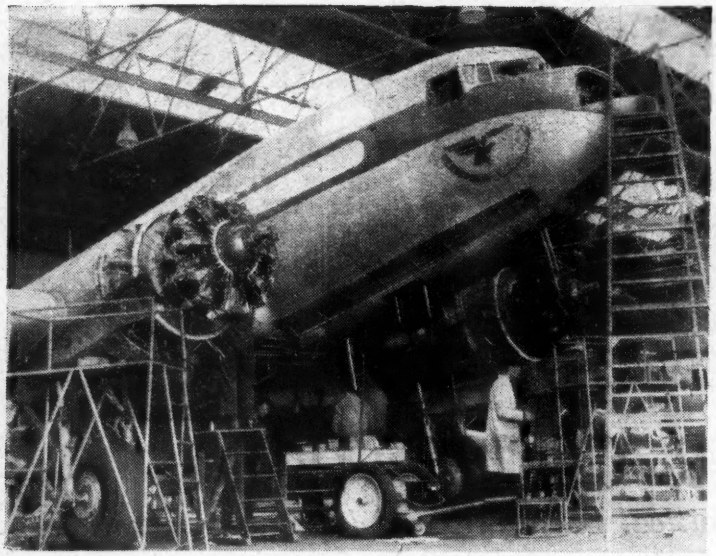
(10) Sir Richard Fairey with the Rt. Hon. G. R. Strauss, P.C., M.P.

A DINNER party was recently given by the President (Dr. Roxbee Cox) and Council of the Royal Aeronautical Society to some distinguished guests to celebrate the granting of the Royal Charter to the Society.

The Charter, which bears the imprint of the Great Seal, is kept at the R.Ae.S. headquarters, and a copy of the wording has been presented to every member. Henceforth, it states, the R.Ae.S. is "One Body Corporate and Politic," and has power to do all things "appertaining to a Body Corporate."

The Society was founded in 1866 under the title of the Aeronautical Society of Great Britain, and was granted patronage and the right to use the Royal prefix at the close of the first World War in 1918. The Charter bears the date of December 22nd, 1948.

CERTIFIED



TOLLERTON: A Middle Eastern Dakota is here seen in the early stages of being stripped for C. of A. renewal.

The Rejuvenation of Civil Aircraft, and How a Specialist Organization Performs It

UNDER the title "Background to Operation" there appeared in the January 20th issue of *Flight* a survey of the scope and layout of one of our leading aircraft-servicing organizations, and in it the general type of work undertaken at the Croydon, Bovingdon, Tollerton and Lympne bases of this particular concern was described. It is the aim in the present article to review in rather more detail the methods adopted by the firm in question—Field Aircraft Services, Ltd.—for the complete overhaul of airframes, engines and accessories.

We will assume that a Dakota, owned and operated by clients of the company in, say, the Middle East, is due for C. of A. renewal. The administrative side of the business having been arranged, the aircraft will be flown in to Bovingdon Airport, Herts, for Customs clearance, etc., and will then be flown up to Tollerton, Nottingham, the main heavy aircraft servicing and repair base of the company. The delivering pilot is asked for a report on the general behaviour of the machine and any defects are noted. The engines are then run to check ground performance and functioning of instruments and autopilot. Fuel and oil are drained and the amount of fuel credited.

It is, of course, usual for complete engine overhaul periods to be arranged so that they coincide with C. of A. renewals. In such instances, the engines are removed, together with all accessories, and despatched by road to the company's Croydon headquarters. If the engines happen not to be due for complete overhaul, the next routine is carried out to the operator's approved schedule. This system applies also to airscrews, i.e., if due for overhaul they are despatched with the engine and accessories to Croydon or, alternatively, the next routine is carried out to the operator's approved schedule.

Rejuvenation Schedule

An inventory is made of the equipment received with the aircraft, and loose items are placed in the stores for safe custody. The aircraft is then stripped: wings, cowlings and fairings are taken off, control surfaces removed, and undercarriage and tailwheel dismantled. Fuel and oil tanks and coolers are removed, together with the hydraulic tank and reservoir, de-icer tanks and autopilot servo unit. All radio sets and similar equipment is taken out, together with all instruments, seats and flooring throughout the fuselage, and head lining in the crew compartment; all toilet-compartment furnishings are stripped, all control cables slipped, flap linkages dismantled, safety belts and harness taken out, and accumulators, and aerials and aerial winch removed.

Inspection is carried out and a report prepared calling for all replacements and repairs necessary to comply with A.R.B. requirements. The A.R.B. then make their own first inspection. The work necessary for renewal of the C. of A. varies somewhat according to the condition of the aircraft, but a certain minimum is called for on the inspection report to comply with the basic requirements.

Mr. J. A. Holden, the works superintendent, has about 150 personnel under his control, and is assisted by Mr. A. H. Voss, chief inspector, and Mr. A. W. Brown, the chief planning engineer. The floor personnel are split into gangs under section leaders, under the general supervision of Mr. H. A. Murden, the hangar foreman, and Mr. G. Mcleod, the fitting foreman. In general, an aircraft will be given to one gang of men, although specialized trades, such as instruments, radio and electrical, are catered for by trade gangs who are not specifically assigned but deal with all aircraft needing attention.

On an average, the time required for overhaul work for renewal of C. of A. in the case of a Dakota is about four weeks. At first sight, this might appear to be rather lengthy, but in the light of the amount of work called for even as a minimum, on the official inspection report, first impressions must be modified. Perhaps the most expeditious way in which we can deal with this is to tabulate the basic work schedule:—

Fuselage: Removal of any signs of incipient corrosion. Reprotection of structure; checking of bolts for tension; checking of operation of emergency exits; renewal of any rusty bolts and nuts.

Mainplanes and centre-section: Inspection and lubrication of all moving parts; renewal of all rusty screws, nuts and bolts; checking of all bolts for tension; protection of structure; removal of any signs of incipient corrosion.

Flaps: Renewal of all worn linkages, pins and/or bolts; removal of any signs of incipient corrosion; checking of flap hinges for security and wear; protection of structure; lubrication of all moving parts.

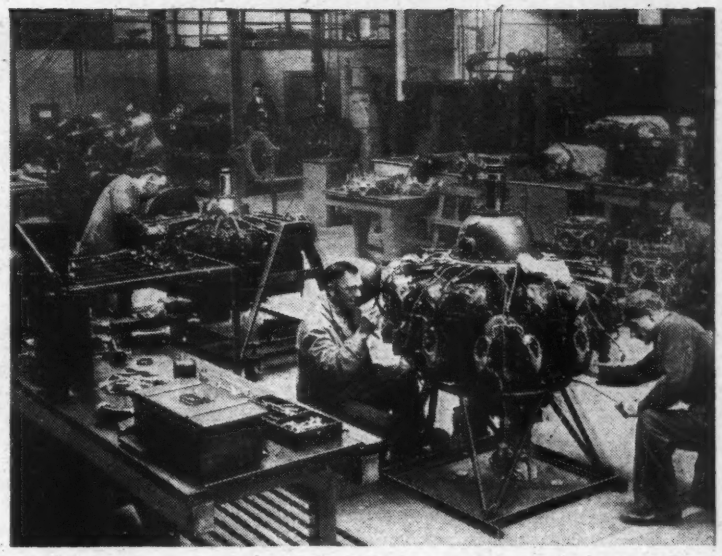
Covered components, ailerons, elevators and rudder: Renovation of fabric; checking of all bolts for tension; renewal of worn hinge-pins and bearings; lubrication of all moving parts.

Tailplane and fin: Checking of tension in bolts; reprotection of structure; removal of any signs of incipient corrosion; renewal of any rusty screws, bolts and nuts; lubrication of all hinges and bearings.

Undercarriage: Renewal of all worn pins, bolts and shackles; renewal of time-expired or deteriorated bungee; replacement of any deteriorated brake linings; removal for inspection (and, if necessary, renewal) of tyres and tubes; replacement of scored or distorted brake drums; servicing of oleo legs; lubrication of all moving parts.

Tailwheel: Removal for inspection (and, if necessary, renewal) of tyre and tube; renewal of all worn pins, bolts and bushes; servicing of oleo strut; lubrication of all moving parts.

AIRWORTHY



CROYDON: Re-conditioned, air-cooled engines of many types are to be seen in process of re-assembly in the shops.

Heat and ventilating systems: General overhaul of all controls, pipes and lagging.

Flying controls: Inspection of all cables from end to end for fraying; protection of cables after cleaning; checking of all pulleys for damage and wear, and lubrication of bearings; checking of all fairleads for wear and correctness of cable runs; removal, inspection and replacement of all worn pins, bolts or bushes.

De-icer system: Internal inspection of tanks for cleanliness and freedom from corrosion; pressure-testing of tanks; blowing-through of all pipe lines; checking of all controls for correct functioning; colour-coding of pipe lines. (If surface de-icer overshoes are deteriorated they are replaced, but such work is considered an addition to normal C. of A. overhaul.)

Hydraulic system: Reservoir pressure-tested; tank cleaned internally and pressure-tested; all pipe lines blown through; checking of all unions for tightness and locking; colour-coding of pipe lines.

Cowls and fairings: Repairing and reprotecting as necessary.

Engines and installation: Unless removed for overhaul, servicing of engines, all accessories and controls to operator's approved schedule in accordance with the hours flown.

Airscrews: Unless removed for complete overhaul, servicing in accordance with operator's approved schedule according to the hours flown.

Fuel tanks and system: Inspection of tanks internally for cleanliness, and pressure test; pressure and ball test of all pipe lines; pipe lines blown through and colour-coded.

Oil tanks and systems: As above.

Oil coolers: Thorough flush-out and pressure test.

Radio: Overhaul and test of all radio sets and accessories; check of fixed portion of radio equipment in aircraft for cleanliness, security of all attachments, and wiring; megohm test of all wiring and aerials; check with ohmmeter of all bonding.

Electrical services: Checking of all wiring, junction boxes, etc., for cleanliness and attachments; checking of correct value of fuses; carrying-out continuity; functioning and megohm tests; servicing and charging of accumulators; reprotection of all accumulator stowages with acid-proof paint.

Instruments: Overhaul and test of all instruments; blowing-through of all pipe lines and checking of all joints and unions for tightness; cleaning of all filters in autopilot system; overhaul and test of autopilot servo unit.

Modifications: Incorporation of all essential modifications, and satisfying of all Service Notes, Service Technical Instructions, and Defect Reports.

Miscellaneous: Safety belts proof-loaded; lifebelts, if fitted, tested.

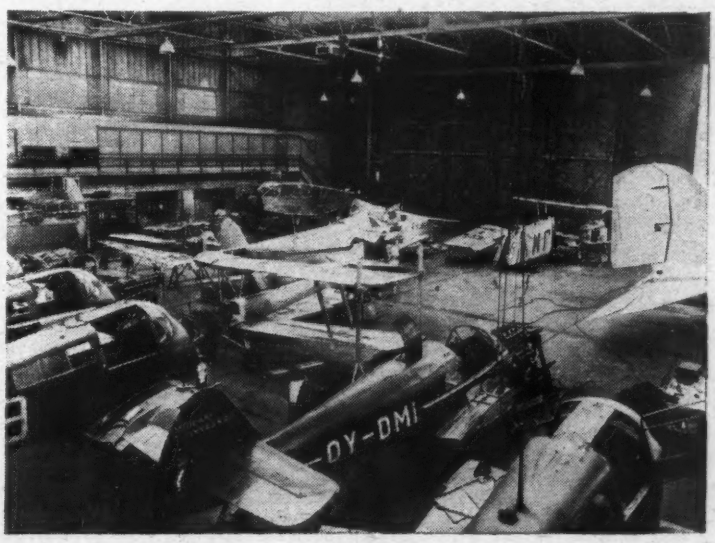
Upon completion of detailed items on the inspection report, the aircraft is completely reassembled, weighed and C. of G. determined. Flying controls are connected up and adjusted, travels of control surfaces are checked and control adjusters locked. A duplicate inspection of controls is then carried out. Attachment bolts of mainplanes, tank panels, engine mountings, fin joints and landing wheels are torque-loaded. Rigging of the aircraft is checked. Radio installations are ground-tested and submitted to M.C.A. Telecommunications Branch for inspection and approval. Electrical services are all function-tested.

Fuel gauges are checked during fuelling and engines are run on ground and fuel-flow tests taken. During engine run, instruments are checked and the autopilot function-tested.

Flight Testing

The aircraft is then air-tested; not less than three flights, covering in all a period of five hours, are considered necessary to ensure that every item of equipment and the aircraft as a whole will give the owner every satisfaction. During air test the radio is operated and clearance obtained from M.C.A. for renewal of licence.

Upon completion of air tests, the aircraft is submitted to the Air Registration Board's surveyor for renewal of its Certificate of Airworthiness. The inventory is then re-



SPOTTING EXERCISE: A wide diversity of types seen in one of the Tollerton hangars.

Certified Airworthy . . . .

checked and loose equipment stowed in the aircraft. A final quality check is then carried out.

In addition to C. of A. work, the conversion of ex-Service Dakotas (i.e., DC-3 or C-47) to civil guise forms the bulk of Field's activities at Tollerton. The normal conversion sheme takes about six to eight weeks, but in the conversion to a different layout of a civil type with a current of A. (e.g., freighter to passenger), the time required is only two to three weeks.

The formalities attendant upon ex-Service Dakota conversions are rather interesting. No matter whether the machine is bought from the R.A.F. or the U.S.A.A.F., when converted to a civil type it is, effectively, an American export and, as such, must satisfy the C.A.A. standards as well as those of A.R.B. Consequently, whilst the conversion is being executed, the C.A.A. representative in this country, Mr. Rostoe, makes inspections to satisfy himself that all the latest modifications are incorporated and official requirements met. Mr. Rostoe will not issue an "export permit" until the aircraft fully complies with the required conditions and, in turn, the A.R.B. and M.C.A. will not issue a C. of A. until the "export permit" is issued: this is, of course, a safeguard for the American Department of Commerce. After this, the A.R.B. make their inspection and, should the aircraft be the property of a foreign company, the national inspectorate concerned will also make their survey, unless, of course, the A.R.B. are requested to act for the foreign authorities.

A particular case may be cited to illustrate the international formalities which may have to be complied with. In this instance, the aircraft was an ex-R.A.F. Transport Command Dakota, which was bought by a French operating company; this concern paid the United States Government for the aircraft, as it was Lease-Lend property. The aircraft having been bought, Fields were requested to collect it from Prestwick and to carry out a conversion scheme and C. of A. schedule. Before this could be done, Fields had to contact the French Bureau Veritas and Ministry of Transport in order to ask that these authorities should request the British Ministry of Civil Aviation to issue a permit to fly the aircraft from Prestwick to Tollerton. This rigmarole having been brought successfully to a conclusion, and the requisite permit to fly issued, the aircraft was prepared for flight and collected.

About twenty Field conversions of ex-Service Dakotas have been made at Tollerton in the last two years, during which period six C. of A. renewals have also been done, some of which have entailed considerable internal modification in addition to the work required under the C. of A. schedule. Dakotas are by no means the only aircraft to be seen at Tollerton. In point of fact, at the time of our visit, four ex-B.E.A. Vikings were undergoing modification and C. of A. renewal for Hunting Air Travel, who will use them for charter work, one of the more important transport contracts this company having recently negotiated being in connection with the African groundnut scheme. A good deal of work is also concerned with C. of A.s for the smaller aircraft types, ranging from Rapides down to Proctors. We saw three Dakotas, four Vikings, 14 Proctors, and a Gemini in the hangars.

"Flight" photograph.

Most types of aircraft instruments can be handled in the workshop-laboratory at Croydon.

"Flight" photograph.

Cylinder re-conditioning is carried out as a separate specialist process, the finished units being fed into a stock pool.

Croydon Capacity

Having dealt with the airframe side of the company's activities at Tollerton, we might now with advantage review the similar scale of work which is undertaken at Croydon. In addition to being the company's headquarters, Croydon accommodates the engine, airscrew and accessory divisions, whilst also providing 24-hour service for commercial operators and private owners, and day-to-day maintenance, daily and routine inspections, housing, cleaning, minor repairs and modifications to airframes. Here also is the central provisioning store from which spares can be rapidly despatched to any part of the world.

As previously noted, when an aircraft comes in for C. of A. renewal, the engine, airscrew and accessories, etc., will more often than not be despatched by road to Croydon for reconditioning, unless, of course, they happen not to be due for such treatment. However, it is not only units from aircraft undergoing C. of A. conversion that come in to Croydon. Referring back to the initial example of a Dakota owned and operated by clients of Field's in the Middle East, and which comes to the company for C. of A. renewal, it may well be that the owners would take the opportunity of using the aircraft to deliver a couple of spare engines to Croydon for reconditioning, so saving transport costs. This is a normal thing when a company have their own float of spare engines, but the more usual method is for engines to come in by road and sea.

Before going on to review the sequence of the work entailed in engine reconditioning, there are one or two commercial aspects which warrant attention. For units coming in to Fields from abroad—whether aircraft or engines or both—a temporary import licence is required and, as a natural corollary, when the work is finished and the aircraft and/or engines are ready to be returned, an export licence is necessary. Furthermore, Field Aircraft Services, Ltd., are required to deposit a bond to cover the value of the "import," the amount being assessed by consultation between Fields and H.M. Customs, the figure usually being determined on the basis of the value of the finished job.

For Pratt and Whitney 1830/92 and 1830/90C engines, as used in Dakotas, Fields have three schemes to offer customers:—

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(1) A complete exchange scheme whereby the customer sends in his engine and receives in return a reconditioned engine "off the shelf," for the sum of £750. There is no delay involved; the new engine can be despatched on receipt of order, although, of course, for overseas clients, the business of export licences and so forth may cause some delay. It is necessary that the incoming engine should have a known history to a standard approximating to that of airline work.

(2) A price-plus-cost scheme whereby the customer sends in his engine and it is stripped and reconditioned for a basic price of £350, plus the cost of any spares necessitated in achieving the operating standard. For this scheme, it is not necessary that the engine received should have a known history to any particular operational standard, but the customer is informed if Fields consider that the repairs required are so extensive as to be uneconomical.

(3) An inclusive-charge scheme whereby the customer sends in his engine for overhaul and repair, work which is undertaken complete for an inclusive sum of £675; for this scheme, it is essential that the engine has a known history of reasonable operational standard.

In addition to these three alternatives, Fields offer completely reconditioned engines for sale at £1,200, this price, as for the others quoted, being ex-works. Although the major part of engine reconditioning activity is concerned with Pratt and Whitney engines for Dakotas, air-cooled engines of all types can be catered for at Croydon and, in fact, quite a number of de Havilland Gipsy power units are dealt with. However, in that the numbers concerned are relatively small, these engines are treated individually by one crew of men, and do not flow through the shops in the same process formation as do the larger radials. Liquid-cooled engines are not handled at Croydon.

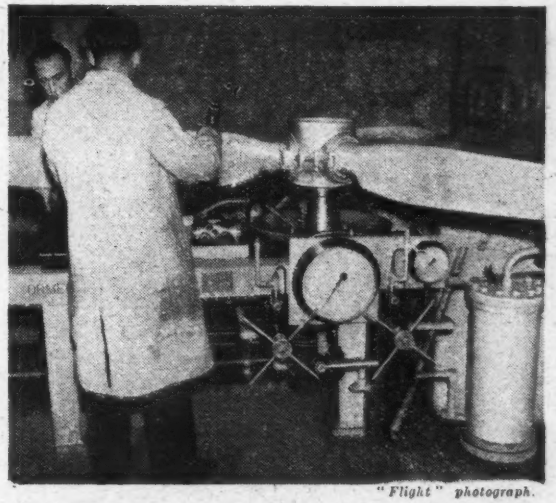
Operational Sequence

Under Mr. J. L. Smith, the director and general manager, the technical side at Croydon is supervised by Mr. R. W. Fox, assistant general manager. Mr. H. Leggatt is the chief inspector, and with Mr. H. Standing (superintendent, engine division), Mr. L. T. Brown acts as technical supervisor and Mr. J. H. Bullock as inspector-in-charge. The sales organization for Field Aircraft Services, Ltd., is in the hands of Mr. J. Lester Pendleton.

When an engine is received at Croydon, no matter whether it arrives by air or by road, it is taken into the reception bay, where an initial external inspection is made to determine the condition and whether there are any externally evident missing parts; this preliminary having been completed, the engine then proceeds to the stripping bay. Here, it is completely dismantled and all the multifarious bits and pieces are placed in component trays whence they are sent to the cleaning tanks. Normally, the component parts of a particular engine are kept together, except for the cylinders, the reconditioning of which is a fairly long job. For this reason cylinders are separately treated and new ones drawn from a common pool.

After cleaning, the components are subjected to detailed inspection. The inspection-sheets list every part under its individual number and those components that are rejected in the first viewing go into the scrap bins, but reclaimable parts are sent out into the shops for renovation. Here, inspection is made on the spot during the reconditioning process, but if the circumstances of a particular case render it necessary, the part concerned can, of course, be sent back to the viewing room for final inspection.

From the view room, the trolley containing all the components of the engine (except cylinders) goes into a pool stores in which those components rejected in the view room are replaced with new or reconditioned stock. The completely broken-down engine is then issued to the shops and the various sub-assembly benches take their respective parts. For example, the crankcase and all its component elements are dealt with at one point, the reduction gear is dealt with somewhere else, and the supercharger assemblies handled at yet another place. After rectification, the various components are conned by the shop inspection-staff who check that the required reconditioning has been carried out and that the individual part comes within the tolerance limits laid down for it. The parts having successfully passed inspection, they are ready for reassembly.



"Flight" photograph.

In the airscrew shops at Croydon, de Havilland and Hamilton Standard Hydromatic airscrews of all types are re-conditioned.

The normal level of work is that approximately 12 Pratt and Whitney engines are going through the shops at any one time, the normal turn-round period for a complete reconditioning being about three weeks; if necessary, however, an especially urgent job can be dealt with rather more quickly. The work on Gipsy engines varies in level a great deal; a short while ago, five engines of this type were handled in a week, but this was an exception to the normal rule. It does, however, indicate that the capacity is there if it is required.

After final assembly the engines are taken to the company's test beds at Woodmansterne, where each undergoes a check-running period of six hours. Following this, it is brought back to Croydon for final check for locking, blanking-off all orifices and for internal inhibiting. External inhibiting is done only if the customer especially requests it or, of course, if the engine is going abroad.

In addition to complete engines, Fields also handle carburettors, magnetos and general ancillary components, quite apart from the facilities which they offer on radio equipment, instruments and airscrews. In the radio field, the company can undertake overhaul of virtually any item of commercial aviation radio equipment and have facilities for testing ancillary equipment, such as valves and aerials. The position is much the same in regard to instruments: a nicely equipped little laboratory offers facilities for overhauling and testing all types of aneroid, mechanical and air-gyro instruments, whilst electrical instruments are subcontracted.

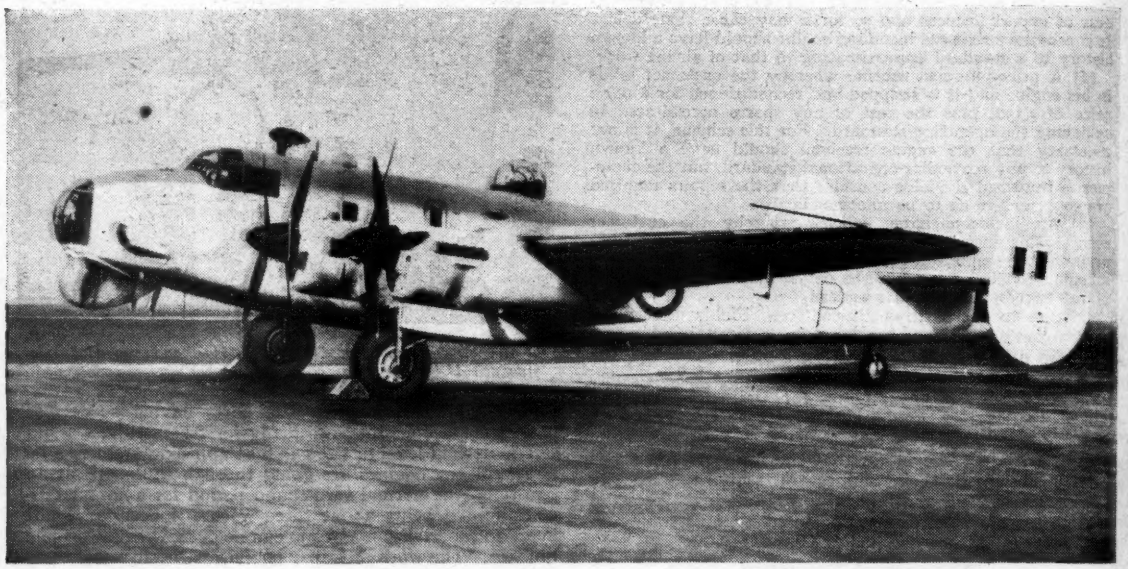
Airscrews are dealt with in a shop well equipped for handling Hydromatic (Hamilton and de Havilland) types or, for that matter, almost any other type that may come in. As with engines, airscrews are check-inspected on arrival prior to being stripped and cleaned. The units are then subjected to magnetic crack-detection and are detail-inspected; at the same time, any parts needing replating or anodizing are despatched for treatment. The job is then put out on the shop floor for rectification of any snags which may have been found. This having been done, the airscrew is reassembled, checked for torque loading, and then balanced. The final operation is a process check and actuating test.

Approximately eight airscrews of various types are in process of overhaul at any one time, the turn-round period for Hydromatic and the smaller D.H. bracket-type two-bladers being of the order of three weeks. There is, at present, no exchange scheme operating for airscrews as there is for engines, although such an arrangement is scheduled for the near future. However, Fields do keep a stock of reconditioned airscrews on hand from which a customer's needs can be met.

C. B B-W.

FOR MARITIME RECONNAISSANCE

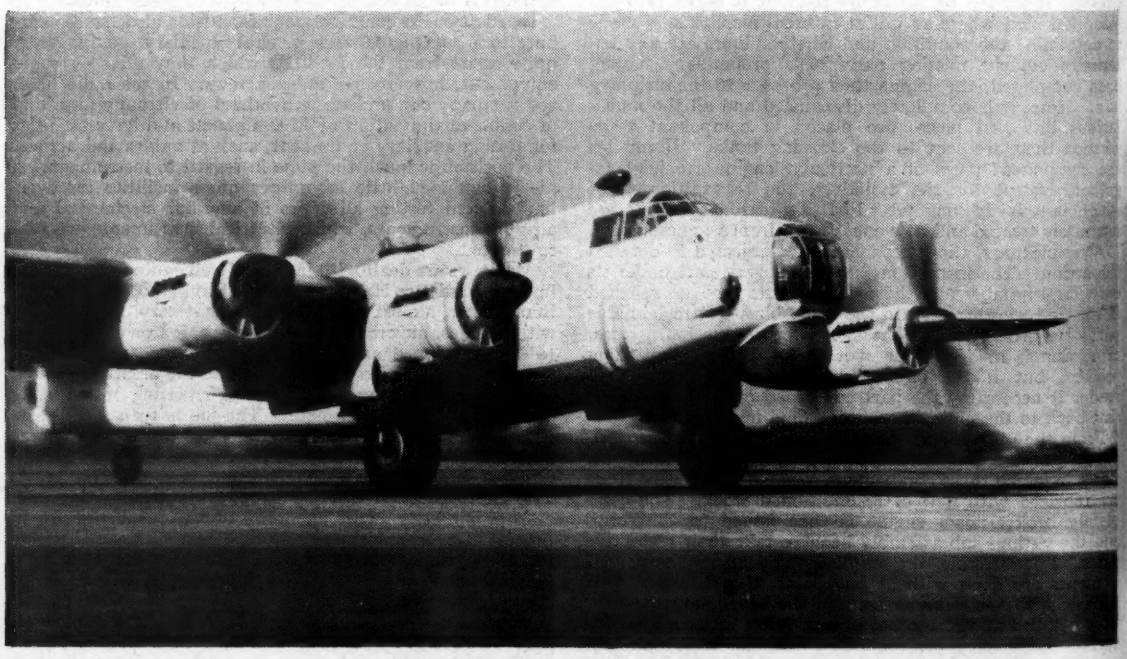
First Views of the Avro Shackleton G.R. Mk.1



MANIFESTLY a descendant of the Lincoln bomber, the Avro Shackleton G. R. Mk. I, developed for service with Coastal Command, is a heavier and more powerful aircraft. By virtue of its great fuel capacity and the economy of the four Rolls-Royce Griffon engines, driving six-blade de Havilland contraprops, it should be capable of very long range. Though details are restricted, the Shackleton is evidently equipped with elaborate search radar (the "radome" beneath the nose provides a distinctive recognition feature), and, in addition to the Bristol B.17 mid-upper and tail turrets (with 2×20 mm and 2×0.5in guns respectively), there is an unusual twin-cannon installation in the nose. A crew of ten will normally be carried.

The prototype Shackleton first flew, at Woodford, on March 9th, with Mr. J. H. Orrell as pilot. On this occasion it was airborne after a run of 14 seconds.

Dimensions are: Span, 120ft; length, 77ft 6in; height, 17ft 6in.



Though no contender for honours in a concours d'elegance, the Shackleton has an air of sturdy efficiency. Coastal Command, still flying its faithful Lancasters, may expect good service from this, the R.A.F.'s largest four-engined aircraft.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

MERLIN-BALLIOL : A high all-round performance and exceptional manoeuvrability characterise the Boulton Paul Balliol 2 advanced trainer, now in production. The engine is a Rolls-Royce Merlin 35.

R.A.F. Promotions

THE Air Ministry announces the promotion, from Air Marshal to Air Chief Marshal, of Sir George C. Pirie, K.B.E., C.B., M.C., D.F.C., Ll.D., Air Member of Council for Supply and Organization, and the Hon. Sir Ralph A. Cochrane, K.C.B., K.B.E., A.F.C., A.O.C.-in-C., Flying Training Command.

Air Chief Marshal Sir George Pirie, who was born in 1896, has been in his present appointment since September, 1948. He is a former Inspector-General of the R.A.F. Sir Ralph Cochrane, who is 54, was appointed to Flying Training Command 18 months ago, before which he was A.O.C. Transport Command.

Sea Hornet 22

DETAILS have lately been released of a new Mark of de Havilland Sea Hornet—the P.R.22, a photographic-reconnaissance version of the F.20, which it closely resembles. However, the four 20-mm guns have given place to camera mountings in the forward and after portions of the fuselage. For day reconnaissance two F.52 cameras are fitted, or one Fairchild K.19B for use at night. Bombs or R.P.s may be carried for strike operations.

Internal fuel tankage of the Sea Hornet 22 is 419 gall, and two 100-gall drop-tanks may be fitted, giving a range of 2,050 miles. Maximum speed, at 22,000 ft, is 467 m.p.h., and operational ceiling is 37,500 ft. Day and night all-up weight figures are 18,230 lb and 16,804 lb respectively; weight empty is 12,773 lb.

Air Minister Visits Panshanger

THE Secretary of State for Air, Mr. Henderson, recently paid a call at No. 1 Reserve Training School, Panshanger, Hertford, in order, as he said, "to find out what pilots and aircrew are thinking." A feature of the visit was to have been a demonstration of the Chipmunk, the new trainer for the R.A.F.V.R. in replacement of the Tiger Moth. None was available, however, and the Minister had to content himself with a trip in a Tiger.

After inspecting the buildings and the control tower, Mr. Henderson chatted with some of the pupils. He told them not to imagine that members of the V.R. were forgotten souls, and asked for any ideas they might have. This brought the immediate suggestions, from two pupils, that the 15-day training period should be spent either with a regular squadron or on the Berlin Air Lift. The Minister seemed impressed by the latter idea and promised to look into its possibilities. Mr. Henderson lunched in the pupils' mess.

"Flight" photograph.

SUNDAY AT PANSHANGER : The Air Minister talking to R.A.F.V.R. pilots of No. 1 Reserve Training School during the visit mentioned in the paragraph above. With Mr. Henderson are (left to right) Mr. W. E. Nixon, managing director of de Havillands, W/C Pike, manager of the school, A. Cdre. E. D. H. Davies, A.O.C. No. 65 London Reserve Group, and W/C. Moon, chief flying instructor.

Supply-Dropping in Malaya

SINCE the beginning of the year the R.A.F. has dropped over 150,000 lb of supplies to troops and police operating against bandits in Malaya. With its dense jungle and few roads, Malaya presents great difficulties to the movement of ground forces. But for the R.A.F. Dakotas, whose aircrews can accurately place supplies of rations, ammunition and equipment on dropping zones often not more than 30 yd square and surrounded by tall trees, the troops' range of action would be severely restricted.

R.A.F. Appointments

THREE new appointments of Air Ministry Directors are announced. A. Cdre. B. E. Essex, C.B.E., formerly Senior Equipment Staff Officer in Mediterranean and Middle East Command, has become Director of Equipment (A). Taking up the acting rank of Air Commodore, Group Captains C. E. Chilton, C.B.E., and L. R. S. Freestone, O.B.E., have been appointed Director of Personal Services and Director of Armament respectively. A. Cdre. Chilton has been until recently Deputy Director of Navigation, and since July, 1948, A. Cdre. Freestone has been Deputy Director of Technical Plans.

Similarly promoted are G/C. H. W. Merton, O.B.E., who becomes head of

Service Aviation . . . . .

the R.A.F. delegation, and A.O.C. the R.A.F. in Greece, and G/C. F. W. Felgate, now Senior Equipment Staff Officer at Mediterranean and Middle East Command. Both officers have lately served at the Air Ministry as Deputy Directors, A. Cdre. Merton on Air Foreign Liaison duties, and A. Cdre. Felgate in Equipment.

R.A.F. Shooting and Rowing

THE 23rd annual championship meeting of the R.A.F. Small Arms Association will be held at Bisley from June 11th-17th.

At Reading on May 7th the R.A.F. Rowing Club will hold its annual regatta, and on the following day trials will be held for the selection of an R.A.F. eight for the Henley Royal Regatta.

R.A.F. Permanent Commissions

THE following personnel have been selected for permanent commissions in the various branches indicated:—

GENERAL DUTIES BRANCH.

Squadron Leaders: C. F. Babbage, D.F.M., B. J. Hooper, D.F.C., T. G. Hynes, D.F.C.
Flight Lieutenants: R. Allen, P. S. Arnsby, G. M. Braid, N. T. R. Bulpitt, M. R. S. Cunningham, R. Currie, D. B. Delany, A.F.C., W. A. Gill, D.F.C., E. E. Shand, L. M. Wakeford, D.F.C., P. F. T. Wakeford, O.B.E., T. W. Willmot D.F.M.
Flying Officers: A. G. Ellis, B. F. Hills, R. Marsh, P. C. Wyche.

TECHNICAL BRANCH.

Squadron Leaders: A. E. Gunn, W. R. Watts.
Flight Lieutenants: J. Blacklaw, R. J. Franklin, M.B.E., S. L. Gordon, A. F. Hindell, J. R. Jaques, J. Riley, L. F. Shaw, S. A. Richens, H. C. Taylor.
Flying Officers: C. F. Houghton, O. P. Osborne, J. Young.
Warrant Officer: E. B. Williams.
Flight Sergeants: P. H. Francis, B. P. Murphy, P. J. Parks, L. Stephens.
Sergeants: S. M. Clarke, G. B. Foort.
Corporal: D. I. Barton.

EQUIPMENT BRANCH.

Flight Lieutenants: W. R. Hart, A. Lawson, P. Smith.
Flying Officer: F. H. Healy.
Warrant Officer: K. Macrae.
Sergeant: W. G. Phillips.

SECRETARIAL BRANCH.

Squadron Leader: L. D. Vickery.
Flight Lieutenants: D. E. Adamson, R. T. W. Jones.
Flying Officers: E. Bartholomew, D.F.C., R. C. S. Scott.
Warrant Officers: N. D. Gittens, F. J. H. Wood, M.B.E.
Flight Sergeant: F. B. Jepson, B.E.M.

AIRCRAFT CONTROL BRANCH.

Squadron Leader: H. Gandy, D.F.C., A.F.C.
Flight Lieutenants: O. V. Brooks, D.F.C., T. C. Riby, L. W. H. Welch, D.F.C., A. Whitby, D.F.M.

DENTAL BRANCH.

Flight Lieutenant: H. S. Johnson, L.D.S.

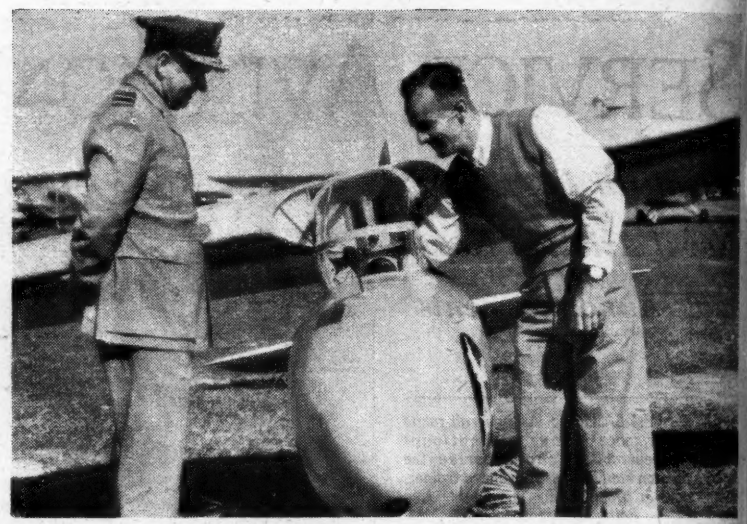
R.A.F. REGIMENT.

Sergeant: L. F. Knight.

AS DIRECTORS OF MUSIC.

Warrant Officers: W. J. Bangay, M.B.E., H. J. L. Cash, F. A. Gale, C. F. Johnson, F. H. R. Lambourne, W. G. Newman, H. E. Wheeler.

Sergeant: T. C. Davies.



N.Z. AIR PAGEANT: A.V-M. A. de P. Neville, C.B., C.B.E., Chief of Air Staff, R.N.Z.A.F., inspects an Olympia sailplane, which Mr. A. Hardinge (right) demonstrated at the Royal New Zealand Aero Club's display in Auckland during March.

FOR EXPORT: Shown on the left is one of five S.A.A.F. Devons which left Hatfield last month for an uneventful five-day delivery flight. This first delivery will be used for tsetse-fly control, although the next batch is for training and communications. South African crews, after a course at the D.H. Servicing School, flew the aircraft. They were led by Maj. S. Theron, seen below with Brig. H. G. Wilmot (right).

Plainfare Developments

HIGH-INTENSITY approach lighting of the "cross-bar" pattern has now been installed at three more Air Lift stations in Germany—Celle, Wunstorf and Fuhlsbuttel. Gatow was equipped last year and several other airfields will be similarly fitted during this year. All the installation work has so far been supervised by Nos. 5352 and 5357 Airfield Construction Wings of the R.A.F., the units responsible for rebuilding all the Air Lift stations in the British Zone.

Reunions

A REUNION for No. 287 Squadron will be held at Ye Olde Cock Tavern, Fleet Street, London, E.C.4, on April 22nd at 1830 hr. Tickets (7s 6d) from R. Grose, Woodstock, Oaklands Road, London, N.20.

* * *

Ex-members of No. 143 Squadron interested in organizing a reunion with other strike squadrons are asked to contact V. Collyer, 4, Sonderburg Road, London, N.7.

* * *

The second reunion of No. 44 M.U., R.A.F., will be held on June 4th. Details from A. R. Hawes, 121, Southgate Road, London, N.1.

* * *

A joint reunion for all ranks of Nos. 462 and 466 Squadrons will be held in London in the Autumn. Details from W. L. Harrison, 6, Cromwell Place, St. Ives, Huntingdon.

* * *

The third reunion dinner for No. 619 Squadron will be held on Saturday, May 14th, at the Connaught Rooms, Great Queen Street, London, W.C.2, at 1830 for 1900 hr. Applications for tickets (17s 6d) to R. G. Purnell, Warwick House, Sevenoaks Road, Pratts Bottom, Kent.

* * *

The 43 Squadron (Fighting Cocks) Association will hold its third annual reunion on April 30th at the Paviour's Arms, Page Street, London, W.1. Tickets (12s 6d) from Hon. Sec., F. Wooley, 16a, Garlinge Road, N.W.2.

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